Metal Finishing

POLISHING AND BUFFING · BARREL FINISHING · CLEANING
PLATING · ANODIZING · RUST PROOFING · LACQUERING & ENAMELING

APRIL, 1960

CONTENTS:

Read and pass on—

1500 KW SILICON POWER INSTALLED at COOPER-BESSEMER PLANT*

The Cooper-Bessemer Corp.'s Grove City, Pa., Plant has recently installed three 500 KW RAPID ELECTRIC Silicon rectifiers which are now supplying heavy cranes, machine tools, ventilators and pumps with d-c power.

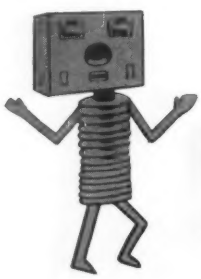
Cooper-Bessemer's selection of Silicon was based on its advantageous (inherent) high voltage characteristics and resulting high efficiency and power factor.

Specially designed protective systems, together with Silicon's natural longevity will insure continuous operation for many years (See insert).

For further information on this installation or other silicon installations and applications write or call, Shop Materials Company**, 733 Washington Road, Pittsburgh 28, Pennsylvania.

*Machinery Builders, (Engines and Compressors.)

**Representing RAPID ELECTRIC in the State of Pennsylvania.



RAPID ELECTRIC COMPANY

2881 Middletown Road • New York 61, N. Y. • TAlmadge 8-2200

Plants: (4) New York, New York • Grays Bridge Road, Brookfield, Conn.

Announcing a chlorinated paint stripper which can be diluted with up to 20 parts by volume of water to form clear effective stripping solutions. Enthone Stripper S-26 will remove epoxy and other synthetic enamels at room temperature—at a make-up cost per gallon less than that of many hot paint strippers!

Stripper S-26 is an acidic, non-flammable chlorinated product, miscible with water in almost all proportions. If you now use conventional, undilutable chlorinated strippers, you can cut your paint stripper consumption at least 84% by using Stripper S-26 at a dilution ratio of 1 part stripper to 6 parts water by volume. At this dilution ratio, Stripper S-26 will readily wrinkle off modern, hard-to-strip epoxies from steel, aluminum, copper, brass and zinc die castings. Because of the large volume of water present in the made-up stripping solution, evaporation losses are much less than with undiluted cold strippers.

Get all the facts right now about economical, cold paint stripping by calling your Enthone representative for a demonstration of Stripper S-26. Or write to Enthone, Inc., 442 Elm Street, New Haven, Connecticut, for complete literature.

ASARCO

ANOTHER PRODUCT OF Enthonics RESEARCH

ENTHONE

A Subsidiary of American Smelting and Refining Company

METAL FINISHING is published monthly by Metals and Plastics Publications, Inc., 381 Broadway, Westwood, N. J., U.S.A.
SECOND CLASS POSTAGE PAID at the Post Office in Westwood, N. J and New York, N. Y. Volume 58, No. 4, April, 1960. Five dollars per year.

No Bright Nickel ever offered more

THE UNIVERSALLY APPROVED

HARSHAW NUBRITE

BRIGHT NICKEL PROCESS

Only Harshaw Nubrite meets all of the following qualifications:

1. *Most experienced* bright nickel process. The Harshaw Nubrite Bright Nickel process has given outstanding results to platers for many years.

2. Accepted as superior—*throughout the world.* Harshaw service is available to users throughout the world with distribution or manufacturing facilities in England, Holland, Australia, and Canada.

3. Operates *successfully* with either *air or mechanical agitation.* Recent improvements permit operation with *either* air or mechanical agitation, depending on *your requirements.*

4. Fast brightness—without sacrificing leveling, ductility, or *outstanding economy.*

5. Addition agents (*all liquid*) stocked throughout the world. Ease of operation is aided by the use of all liquid addition agents in easy to handle containers.

Join the growing number of satisfied users by contacting your nearest Harshaw Branch or write for informative free booklet: Harshaw Nickel Plating Processes.

HARSHAW

THE HARSHAW CHEMICAL COMPANY

1945 EAST 97th STREET • CLEVELAND 6, OHIO

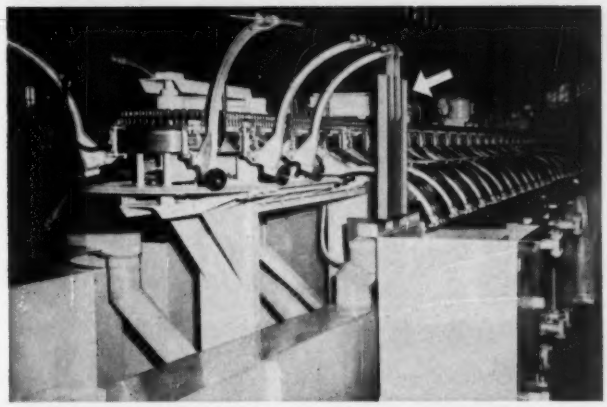
Chicago 32, Illinois • Cincinnati 13, Ohio • Cleveland 6, Ohio • Detroit 28, Michigan
Hastings-On-Hudson 6, N.Y. • Houston 11, Texas • Los Angeles 22, Calif.
Philadelphia 48, Pa. • Pittsburgh 22, Pa.

Plating Processes also available through the following Foreign Distributors or Manufacturers:

Harshaw Chemicals Ltd., London, England
Armalite Co. Ltd., Toronto, Canada
L. Van Der Hoorn, Utrecht, Holland
Robert Bryce & Co. Ltd., Melbourne, Australia

And many Agents throughout the world

VERTICAL LIFT!



Rack size and distance of lift shown by metal plate.

- Offers all the economies of automatic plating on limited and medium-volume operations.
- Permits use of narrower-width tanks for rack plating, thereby reducing space requirements.
- Features smooth, dependable operation and proven design simplicity for which Stevens equipment has long been famous.
- Provides complete application flexibility for electroplating, anodizing, phosphating and other dipping and coating processes.

"Little Steve" in the new, vertical lift model, with the traveling hump cam action, will become an important member of your production plating team. Investigate Stevens' low-cost, automatic plating equipment today!

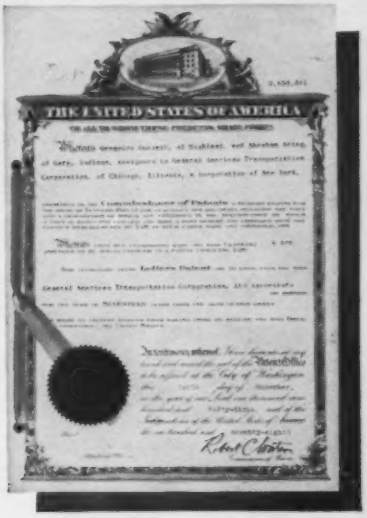
Remember—when you go *automatic* . . . go STEVENS!

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

a Reminder *to those who use chemical nickel alloy plating:*



There is only ONE Kanigen®

and 29 patents prove it

There are no substitutes for Kanigen—no other process that applies a hard, corrosion-resistant nickel alloy coating without the use of electricity as Kanigen does.

With Kanigen, you can plate anything from a small relief valve to a 20,000 gallon tank car with a virtually non-porous, uniform coating.

How can you be sure of getting Kanigen? Only one way—by calling General American or one of its licensees. For further information write:

Kanigen Division
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South LaSalle Street
Chicago 3, Illinois
Offices in principal cities

LICENSEES

INDUSTRIAL KANIGEN CORPORATION
1421 Park Avenue
Emeryville, California

KEYSTONE CHROMIUM CORPORATION
1095 Niagara Street
Buffalo, New York

KEYSTONE METAL FINISHERS, INC.
22 Raydol Avenue
Secaucus, New Jersey

whatever your finishing problem

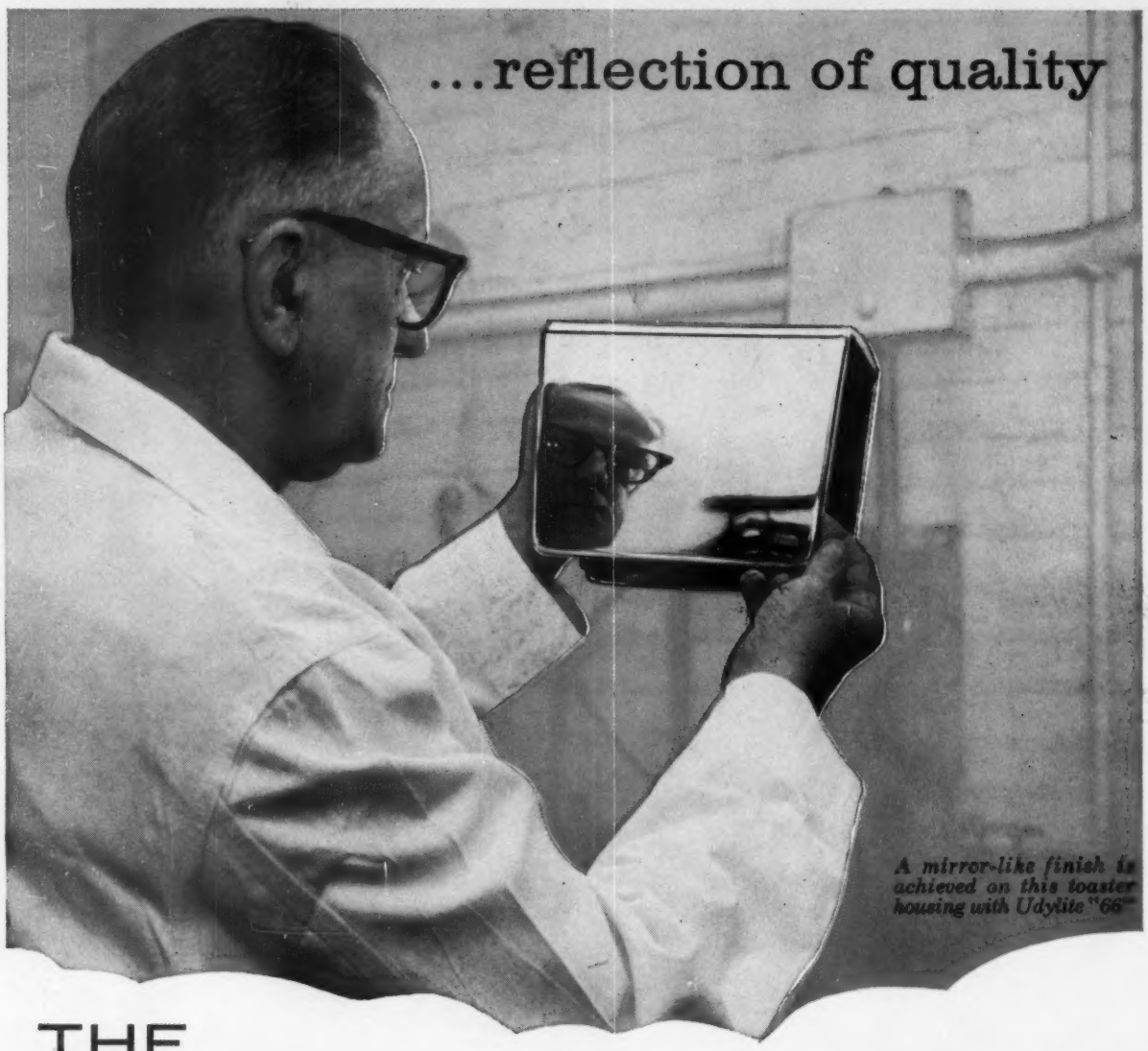
ACME has—or will design—a machine to solve it

Buffing door knobs with a unique and compact Acme machine arrangement produces high volume output. Reducing space in a production line can save important "hidden costs" which cut into profits. Acme utilizes its versatile, floating triple-head buffing lathe to accomplish more buffing in less space. This is one of the operations performed on a high production machine unit which removes "orange peel" and surface defects from all the curved surfaces of the part—gives the knobs an extra smooth, flawless, high color finish, ready for plating.

■ Here is the kind of efficiency that cost-conscious manufacturers expect—*and get*—from Acme. This reputation for excellence in a very specialized field has been earned during 50 years of leadership in solving deburring, polishing, and buffing problems for a wide variety of manufacturers, large and small. Building hardware, automotive trim, electrical and plumbing fixtures, household appliances and kitchenware, primary metal sheets and coils—these are some of the many mass-produced parts now served efficiently by Acme machines.

ACME MANUFACTURING COMPANY

1400 E. 9 MILE ROAD, DETROIT 20 (FERNDALE), MICHIGAN
LEADING PRODUCERS OF AUTOMATIC POLISHING & BUFFING MACHINES SINCE 1910



THE INCOMPARABLE "66"

Udylite's Bright Nickel Process "66" is sweeping the country with new installations and conversions to provide a truly incomparable plate with almost unbelievable ease of operation. The color of the process alone, sells "66" in any comparison.

The production of your existing equipment can be *greatly increased* with the introduction of Process "66". Its outstanding qualities include exceptional levelling ability and remarkable ductility for so bright a finish.

In addition, Process "66" has overcome the problems previously considered inherent in plating over semi-bright nickel and, it is unusually receptive to chromium. You'll find that the amazing adaptability of this very bright finish makes it suitable for your finest work . . . moreover it will save you money.

A phone call or letter will start Udylite's "66" Bright Nickel process on its way to help you improve your production. If it sounds too good to be true, just send us a sample of your product . . . we will be happy to test-plate it for you with Incomparable "66". Act TODAY!

SUPER "66" For even greater brightness and levelling where absolute maximum ductility is not demanded, Udylite's SUPER "66" may be specified. You must see this finish to believe its brilliance.

the udylite corporation

detroit 11, michigan • world's largest plating supplier

Nickel-Chrome Plating Reflects the Quality Appeal of Enduring Beauty

If salt air won't harm the eye-appeal of quality Nickel-Chrome Plating... what will?

De-icing salts? Traffic abrasions? Flying stones and gravel? Freezing temperatures?

All these meet their match in quality Nickel-Chrome Plating... plating with a good, heavy, *double-layer* nickel coating underneath.

For this good, *bright*, double-thick nickel coating with a surface layer of chromium not only provides the shining beauty you see and admire ...but it also provides *lasting* beauty, and beauty *easy* to care for. That's because it protects the basis metals from rust and corrosion. It protects new car trim against nicks and scratches.

So with Nickel in ample supply as far into the future as any man can foresee, you can now plan to use *double-layer* nickel coatings to get this *double* benefit:

1. to improve the appearance of brightwork... to make it more desirable and salable.

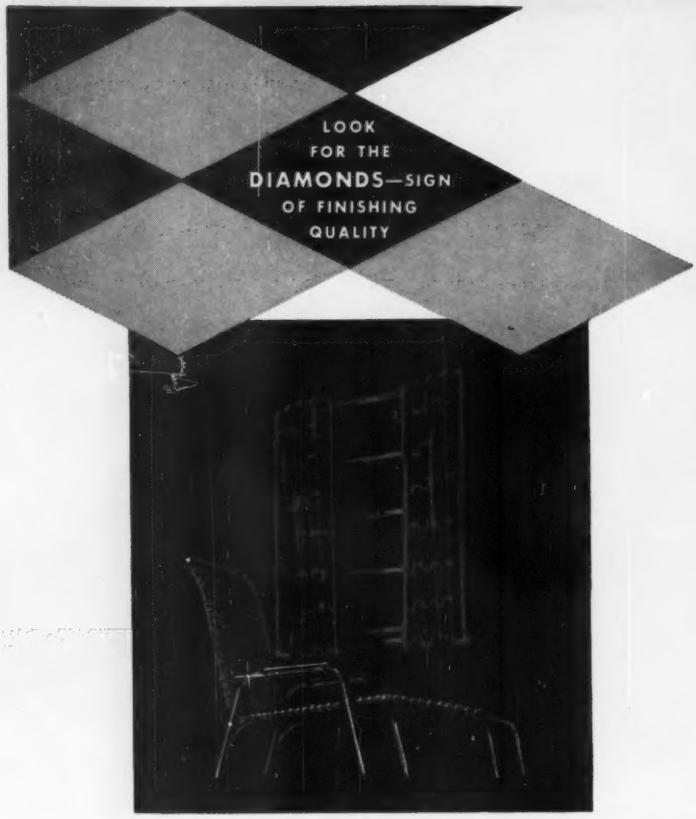
2. to improve brightwork durability to help keep your customers happy, satisfied, *and sold.*

For more information about versatile nickel coatings, write us for our informative booklet, "PRACTICAL ANSWERS TO 40 PRACTICAL QUESTIONS ABOUT NICKEL PLATING."

The International Nickel Company, Inc.
67 Wall Street INCO **New York 5, N. Y.**

Inco Nickel

Nickel makes plating perform better longer



NOW—A Great New Combination for DOUBLE PROTECTION Against Corrosive Conditions on Aluminum, Magnesium or Zinc

IRIDITE®
CHROMATE CONVERSION COATINGS
and
IRILAC™
CLEAR PROTECTIVE COATINGS

Now, here's a fast, easy, economical way to almost double the protection against corrosion on your product. Simply follow up the IRIDITE process with a fast, easy application of IRILAC . . . and you've given your product extra protection for longer resistance to corrosive conditions, longer shelf or storage life protection from handling, and increased beauty for more attractive appearance and faster sales.

ON ALUMINUM

An IRIDITE-IRILAC finish will provide longer life for storm doors, windows, outdoor furniture, auto parts and accessories, tubing or wire goods. And, you have a choice of color finishes such as natural aluminum and golden yellow. Other colors may be obtained by an additional dye operation.

ON MAGNESIUM

IRILAC over an IRIDITE No. 15 finish increases corrosion protection, and provides resistance to finger printing and abrasion on all types of products, with color appearance ranging from light to dark brown.

ON ZINC

IRIDITE plus IRILAC gives your product longer life and brighter appearance. Color choices range from clear IRIDITE to olive drab, plus colored dye finishes.

IRIDITE is the tradename for a specialized line of chromate conversion coatings that can be applied to any non-ferrous metal by brush, dip or spray methods—at room temperatures—manually or with automatic equipment. Upon application, a thin film forms which becomes an integral part of the metal itself, and thus cannot chip, flake or peel. No special equipment, exhaust systems or specially trained personnel are required.

IRILAC is the tradename for a line of clear protective coatings for all metals. As safe and easy to handle as water, they may be applied by brush, dip or spray methods. No exhaust or special fire protection equipment required. Adds protection and abrasion resistance to any base metal, plated part or parts treated with electrolytic or chemical post treatments, without chemical change.

For complete technical information on IRIDITE Chromate Conversion Coatings or IRILAC Clear Protective Coatings, write for FREE TECHNICAL MANUAL. Or, see the Allied Field Engineer in your area. He's listed under "Plating Supplies" in the yellow pages.

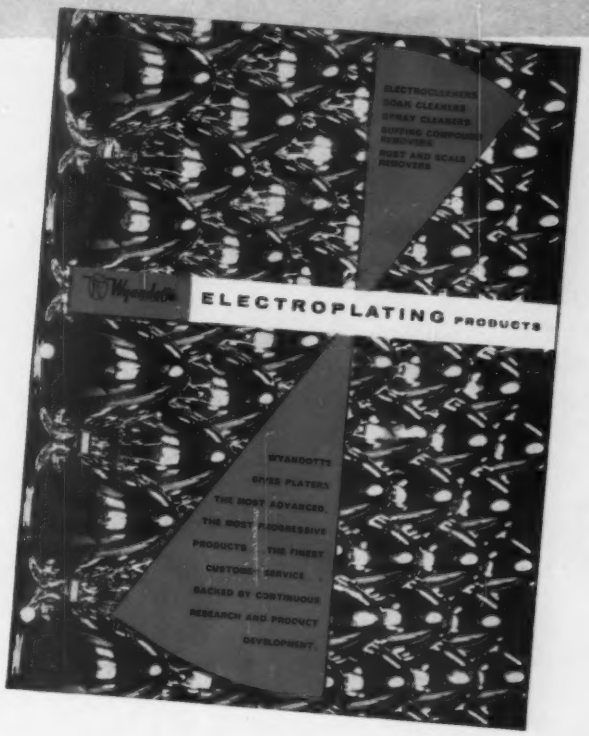
Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electrochemical Processes, Anodes, Rectifiers Equipment, and Supplies for Metal Finishing

IRIDITE® Chromate Coatings	IRILAC™ Clear Coatings	ISOBRITE® Plating Brighteners	ARP® Chemicals & Supplies	WAGNER Line of Equipment

Send for facts on these advanced products for plating preparation!

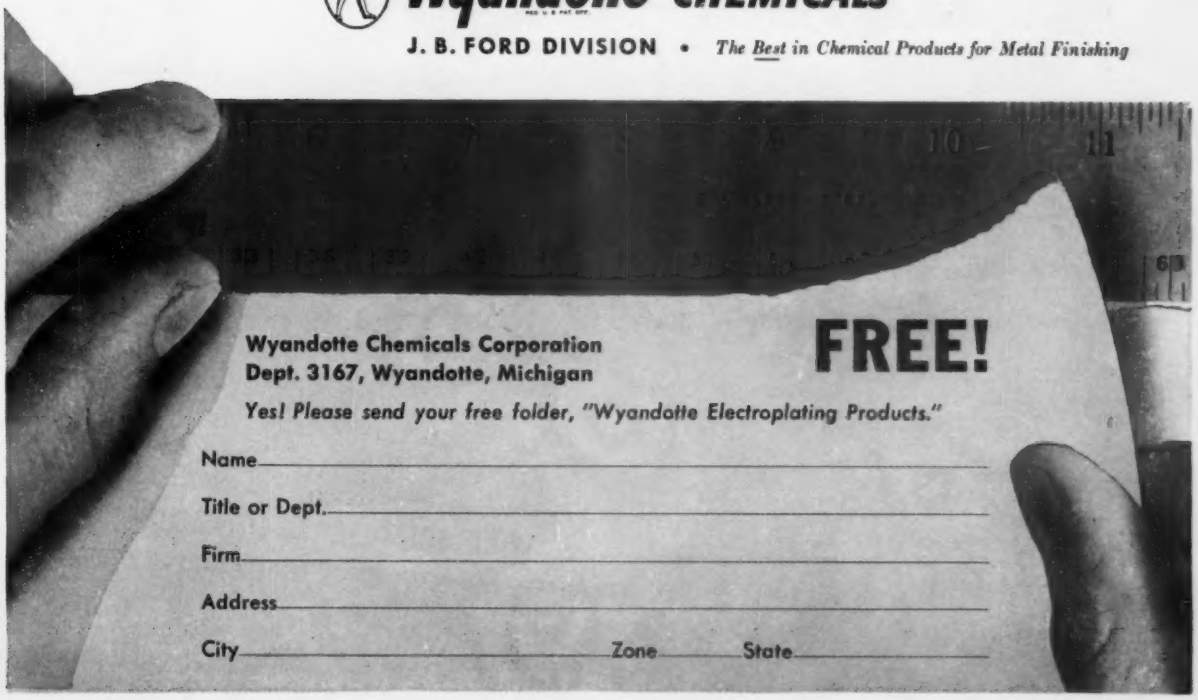


- . . . **electrocleaners**
- . . . **soak cleaners**
- . . . **spray cleaners**
- . . . **buffing compound removers**
- . . . **rust and scale removers**

This new six-page folder gives detailed information on Wyandotte's complete line of electroplating products . . . job-fitted products like BUFSOL for buffing-compound removal, new LECTRITE Z electrocleaner for zinc die castings, EXPRAY® 541 low-foaming spray cleaner. You'll find it an indispensable guide in selecting the products that fit your procedures best. For your free copy, clip and send the coupon today. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California, and Atlanta, Georgia. Offices in principal cities.*

Wyandotte CHEMICALS

J. B. FORD DIVISION • *The Best in Chemical Products for Metal Finishing*



Wyandotte Chemicals Corporation
Dept. 3167, Wyandotte, Michigan

FREE!

Yes! Please send your free folder, "Wyandotte Electroplating Products."

Name_____

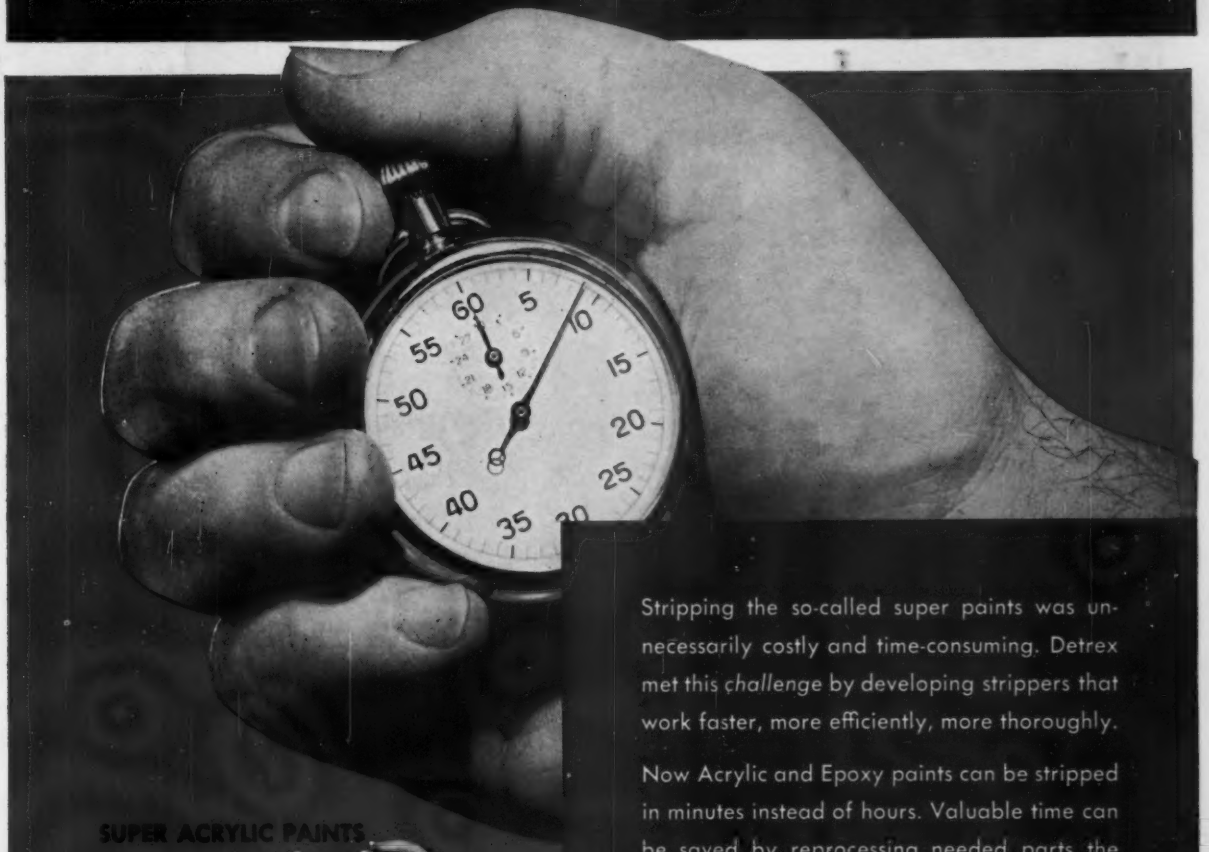
Title or Dept._____

Firm_____

Address_____

City_____ Zone_____ State_____

Now You Can Time Paint Stripping With a Stopwatch



Stripping the so-called super paints was unnecessarily costly and time-consuming. Detrex met this *challenge* by developing strippers that work faster, more efficiently, more thoroughly.

Now Acrylic and Epoxy paints can be stripped in minutes instead of hours. Valuable time can be saved by reprocessing needed parts the same day.

Regardless of your paint stripping method — Detrex can assist you in speeding your operation and reducing over-all costs. Why not talk to a trained Detrex field representative now? They welcome the real "toughies".

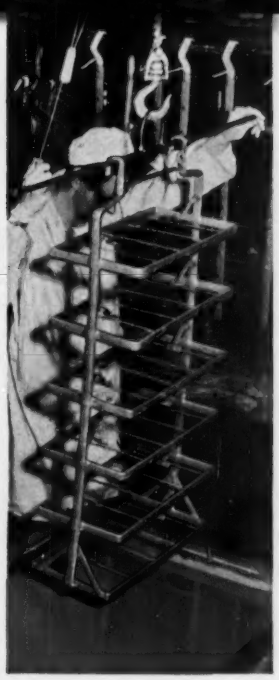
SUPER ACRYLIC PAINTS
Fast!

MODIFIED ACRYLIC PAINTS
Fast!

SUPER EPOXY PAINTS
Fast!

DETREX CHEMICAL INDUSTRIES, INC.

Box 301, Dept. MF-460, Detroit 32, Michigan



Why do 2 out of 3 leaders in the appliance field prefer to work with Coating 218X? Because it assures better control not only of plating quality . . . but also costs.

It's a proven fact. This vinyl plastisol rack coating is so tough and durable, it survives thousands of cycles in severe plating service.

Only Unichrome Coating 218X has a built-in cure indicator to assure optimum toughness. It can't contaminate bright nickel or other sensitive plating baths. If ever necessary, it can be patched and *rebaked* without harm.

Follow the lead of the leading companies. Verify for yourself that using the best quality at the outset saves money in the long run. Coating 218X is available from expert applicators around the country, or can be applied right in your own shop. Send for details. METAL & THERMIT CORPORATION, Rahway, New Jersey.

M&T **coatings and finishes**
METAL & THERMIT CORPORATION

14 OF THE 22 LEADERS IN THE APPLIANCE INDUSTRY

...coat plating racks with Unichrome Coating 218X!

Photo courtesy of General Electric Co.

Competitively proven!

FEDERATED PLATING ANODES, BRIGHTENERS, NICKEL SALTS

You can guarantee consistent high grade results with Federated plating materials, developed, perfected, and competitively tested and proven. In addition to standard brass, cadmium, copper, lead, nickel, tin, tin-lead, and zinc anodes, there are new **Asarcomax** copper anodes and triple-life Conducta-Core lead anodes. **Cadmax** (cadmium), **Zimax** (zinc), **Levelmax** and **Nimax** (nickel), brighteners have set industry standards for performance. Federated nickel salts are of the highest purity and uniformity. Write or call for full information to Federated Metals Division, American Smelting and Refining Company, New York 5, RE 2-9500, or call our nearest sales office, or get in touch with your nearby Federated Plating Materials Distributor

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

FEDERATED METALS DIVISION

Where to call for information:

ALTON, ILLINOIS
Alton: Howard 5-2511
St. Louis: Jackson 4-4040

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Orleans 5-2400

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Fairfax 2-1802

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Chicago: Essex 5-5000
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PITTSBURGH 24, PENNA.
Museum 2-2410

PORTLAND 9, OREGON
Capitol 7-1404

ROCHESTER 4, NEW YORK
Locust 5250

ST. LOUIS, MISSOURI
Jackson 4-4040

SALT LAKE CITY 1, UTAH
Empire 4-3601

SAN FRANCISCO 24, CALIF.
Atwater 2-3340

SEATTLE 4, WASHINGTON
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WHITING, IND. (CHICAGO)
Whiting: Whiting 826
Chicago: Essex 5-5000

IN CANADA: Federated Metals Canada, Ltd.
Toronto, Ont., 1110 Birchmount Rd., Scarborough, Phone: Plymouth 73246

Montreal, P.Q., 1400 Norman St., Lachine, Phone: Melrose 7-3591

"Now, thanks to Columbia-Southern's recommendations, our Trichlor degreasing operation removes stubborn soldering flux, and we have reduced our maintenance costs"

reports Thomas F. McDonough,
Superintendent,
American Meter Company, Inc.,
Philadelphia

Thomas McDonough (right), Superintendent of the American Meter Philadelphia plant, discusses improved degreasing results with Edward Losben, of Globe Solvents.

"We run a fast degreasing cycle, passing soldered gas meters through an electrostatic painting system. So even brief stops caused by faulty degreasing cost us real money. That's why we are so pleased with Columbia-Southern's assistance."

Mr. McDonough speaks with authority. American Meter's Philadelphia plant turns out a giant's share of the nation's gas meters. Every work station in the complicated assembly operation is carefully engineered for efficient production. And frequent inspection stops along the way insure leak-proof meters that give years and years of accurate gas measurement.

This precision and concern for quality is evident in the degreasing set-up, too. American Meter degreases and paints fully assembled gas meters in a continuous, integrated operation. Meter housings consist of two metal shells soldered together. Painting is done electrostatically, to provide an even coat rapidly. Before painting, the meters pass through a large-capacity vapor degreasing machine, with Trichlor used as a solvent. This action removes excess soldering flux—an acid-type material that makes paint peel. The Trichlor treatment also removes grease and soil picked up during handling. End result is a perfectly clean surface that takes—and holds—an even coat of paint. And since some American Meter units are used outdoors, in all types of climates, the paint job must have a long life.

American Meter *has* to get excellent degreasing results. With their fast-moving production cycle, poor handling for even the briefest period of time would lead to a costly number of rejects. Also, because they paint electrostatically, the painting surface must be completely free of all foreign matter, to take the coating ejected during the rapid pass through the paint machine.

To get the most efficient vapor degreasing possible, American Meter called on Columbia-Southern's Technical Service Department. A Columbia-Southern Technical Service Engineer, working with the Columbia-Southern distributor, Globe Solvents Company, Inc., of Philadelphia, inspected the operation and recommended a more careful maintenance program. They found that American Meter had been running solvent with too high an acid concentration from removed flux. This harsh solution harmed the lining of the degreasing machine itself, and pitted the gas meter housings.

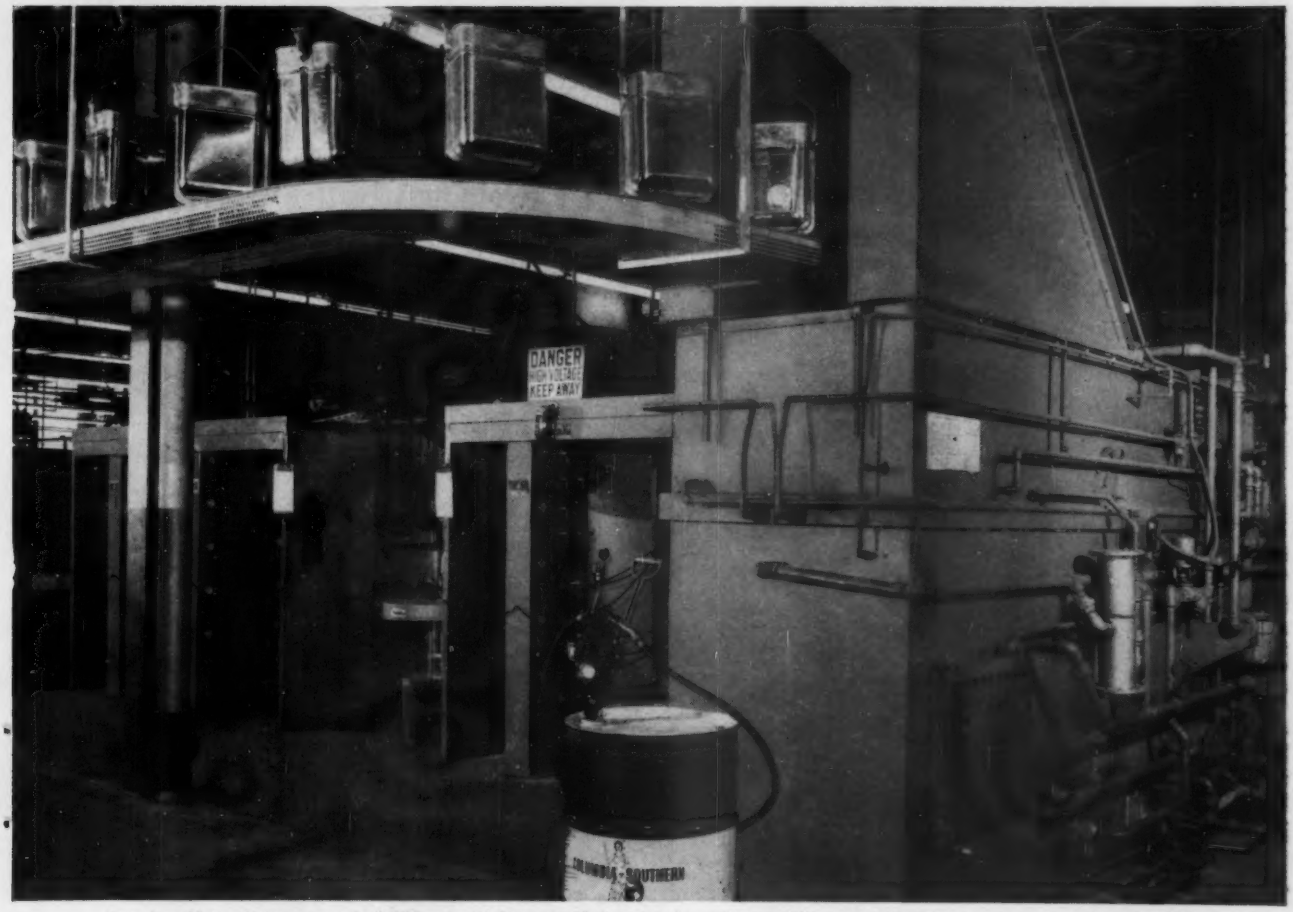
By following Columbia-Southern's advice, American Meter was able to determine the ideal stopping point for cleaning, before passing harmful solvent back into the cycle. This has eliminated the trouble, and American Meter now gets a cleaner meter for painting, and spends less time and cost on degreasing maintenance.

This help from Columbia-Southern's Technical Service Department, combined with excellent service given by Globe Solvents, explains why American Meter is sold on Columbia-Southern Trichlor.

You'll like doing business with Columbia-Southern

American Meter produces gas meters for every need—from small private homes to large hotels and apartment houses.

Harvey Plowfield (in dark suit), American Meter's Standards Engineer, inspects newly soldered gas meter housing at one of plant's assembly lines.



American Meter degreases up to 1,200 completely assembled meters in an 8-hour shift—a fast cycle that demands top quality results.

columbia | southern chemicals

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
A Subsidiary of Pittsburgh Plate Glass Company
One Gateway Center, Pittsburgh 22, Pennsylvania

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland
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Coming next month!

COVERS DETAILS OF EVERY COMMERCIAL PROCESS

METALLIZING OF PLASTICS

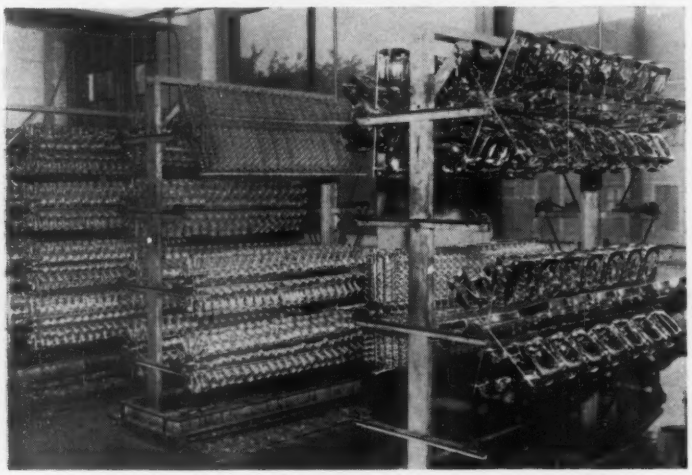
by **HAROLD NARCUS**

President and Technical Director, Electrochemical Industries, Inc.

1960, approximately 224 pages, 55 illustrations, $5.50

THIS EAGERLY AWAITED BOOK presents complete details for carrying out every commercial metallizing process for plastics or other nonconductors. It is the first treatment of the subject that deals with *actual production procedures, formulations* and *techniques* for all known metallizing methods. These include the copper film process (developed by the author), the deposition of "electroless" nickel coatings, a review of the new molded conductive plastics, "gas" plating, the deposition of thick evaporated films and many, many others. The text is replete with illustrations showing the latest equipment being used in the newer processes. Recent advances receive special attention, particularly in the final chapter. This chapter contains developments as recent as a few months ago.

Much more than a bibliographic source, this book is essentially a metallizing manual for the plastics, electronics and electroplating industries.



CONTENTS

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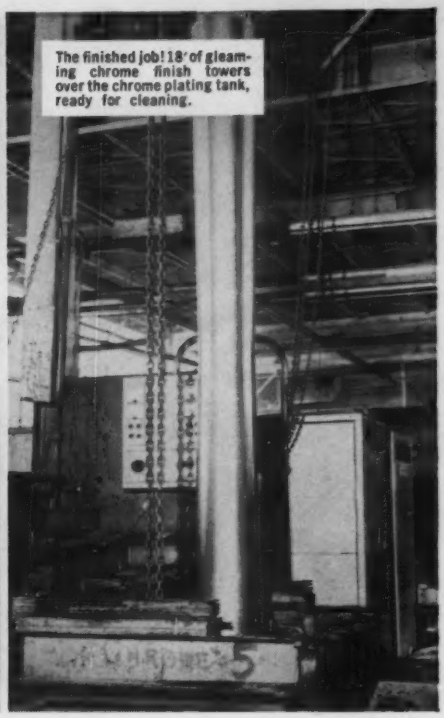
METAL FINISHING

381 Broadway, Westwood, New Jersey

Skilled plater washes down a giant roller for aluminum mill as it is slowly withdrawn from a deep chrome plating tank containing Mutual® Chromic Acid.



The finished job! 18' of gleaming chrome finish towers over the chrome plating tank, ready for cleaning.

Simmons Vertically Plates 18′ Roller For Aluminum With MUTUAL CHROMIC ACID

Being *vertically* chrome plated for use on the world's largest rolling mill — a 170-inch-wide reversing mill at the Reynolds Metals Company Alloys Plant, Listerhill (Sheffield), Alabama—are giant steel rollers for carrying aluminum ingots.

The Simmons Plating Works of Atlanta, Georgia immerses each roller in a 28′ deep chrome plating tank containing Mutual Chromic Acid. The vertical plating process provides a faster, better quality plating job over the entire surface of the roller. Each roller is plated to .005″ minimum thickness in a standard 33 oz. per gal. chromium plating solution at normal plating temperatures of 130°F.

Like many other skilled platers throughout the country, Simmons relies on high purity Mutual Chromic Acid to provide a chrome plate that gives longer wear and resistance to rust and corrosion. Plating with Mutual Chromic Acid also helps to protect the rollers from damaging or scratching the aluminum ingots they convey.

Mutual Chromic Acid is always 99.75% pure—or better. Sulfate content never exceeds 0.1%. Rigid quality control insures that the chromic acid you get is always the same. This makes it easier for you to control accurately the chromic acid-sulfate ratio of your plating bath.

For information on Mutual Chromic Acid, as well as other Mutual chromium chemicals, send coupon for our free booklet, "Chromium Chemicals." Our Technical Service staff will also be happy to answer your questions.

OTHER PRODUCTS FOR PLATERS

SOLVAY® Caustic Potash • SOLVAY Caustic Soda
SOLVAY Hydrogen Peroxide • SOLVAY Methylene Chloride

Allied Chemical

SOLVAY PROCESS DIVISION
61 Broadway, New York 6, N. Y.

MUTUAL chromium chemicals are available through dealers and SOLVAY branch offices located in major centers from coast to coast. Send export inquiries to Allied Chemical International, 40 Rector St., New York 6.

SOLVAY PROCESS DIVISION 44-40
Allied Chemical Corporation
61 Broadway, New York 6, N. Y.

☐ Send Bulletin 52, "Chromium Chemicals"

☐ Have a representative phone for appointment

Name_____

Position_____

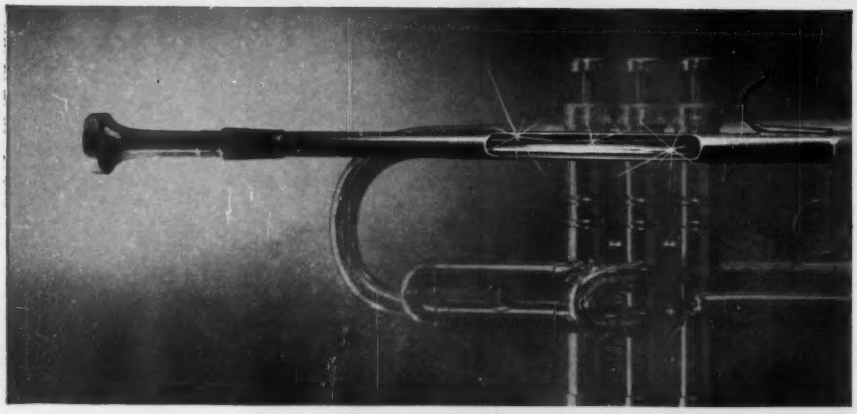
Company_____

Phone_____

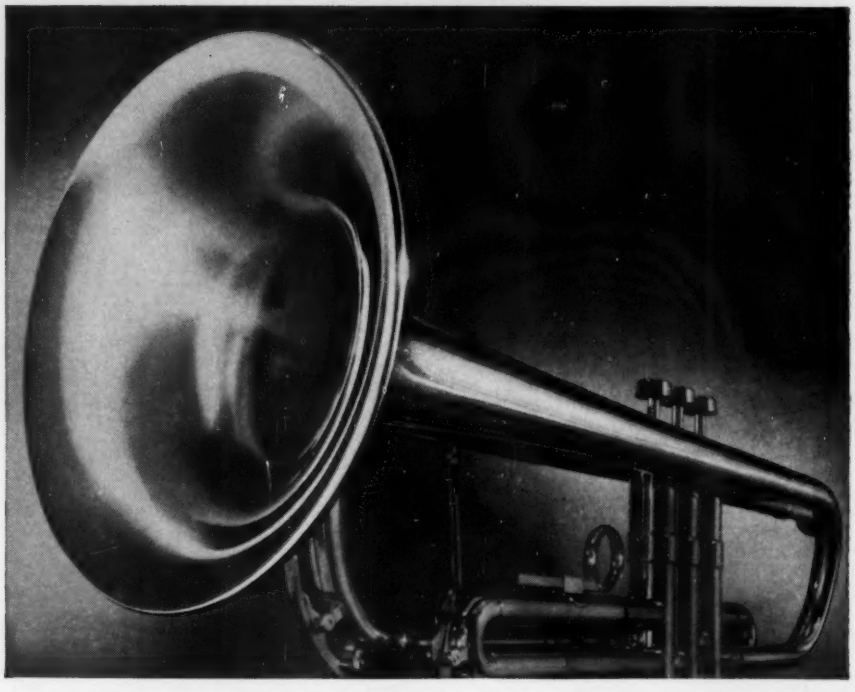
Address_____

City_____ Zone_____ State_____

Conn produces the "heart" of good tone quality by electrodeposition, with "Plus-4" Copper Anodes



CONN ELECTRO-D TONE CHAMBER (mouthpipe) cut away to illustrate the "micro finish" interior surface. Chamber and mouthpiece receptacle are formed in one piece by electrodeposition; previously the two pieces were soldered together. (Patent pending.)



ELECTRO-D BELL, also formed by electrodeposition.

In a cornet or trumpet, good tone and easy playing depend largely on the inside shape and finish of the tone chamber (mouthpipe).

Aiming at perfection, C. G. Conn, Ltd., famous maker of band instruments, turned to forming these critical parts by electrodeposition of copper on stainless-steel mandrels. The deposited copper conforms perfectly to the precision mandrel—providing the exact taper and dimensions every time. It also gives the smooth mirrorlike inside surface that prevents acoustical losses. Even minor irregularities caused by forming sheet metal or tube can muffle, distort, or rattle the tone.

Using "Plus-4" Phosphorized Copper Anodes in its acid-copper electroplating tanks, Conn has found it gets the smooth, dense deposit it needs. The build-up of metal is fast and uniform, as "Plus-4" Anodes' extra "throwing power" is of particular value with the tubular shapes. There are few nodules, which minimizes finishing of the outside surface. And tank maintenance is simplified.

Conn also forms the bells used in cornets, trumpets, and trombones electrolytically. This gives still further control in the precision of the entire inside tone columns of its instruments—for increased resonance and live, powerful tone.

WRITE FOR INFORMATION on how you can obtain a test quantity of "Plus-4" Anodes to supply one tank. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Toronto 14, Ontario.

59108

ANACONDA®

"PLUS-4"® ANODES Phosphorized Copper

Made by The American Brass Company

OR HOW TO DEGREASE MORE PARTS PER DOLLAR OF CLEANING COST

OR X marks the spot where this company's vapor-degreasing troubles began to pile up. Parts coming out of the degreaser should have been shiny, bright. But they weren't.

Clue: There was a fatal weakness in the solvent. It was stabilized—but it didn't have the staying power to take rack after rack of parts loaded with acid cutting oil. Few solvents do.

PSP TO THE RESCUE Now this company buys a degreasing solvent that does not wear out prematurely. A solvent that can't "go sour" without notice and start staining parts instead of cleaning them. A solvent that cuts degreasing cost, because it lengthens the time between degreaser cleanouts by weeks or even months.

You can get this degreasing solvent, too. Just ask for Nialk TRICHLOR. You don't have to worry about its stability. You don't have to add fresh stabilizer. Even the vapor in the bath is stabilized. And you use less of this solvent, because less goes down the drain in needless cleanouts.

For more facts on what you can save with this better, more stable trichlorethylene, give your Nialk TRICHLOR distributor a call. Today.

NEW 36-PAGE BULLETIN explains fully how you get more and better vapor degreasing for the money with Nialk TRICHLOR. Shows basic types of vapor degreasers. Discusses cycles, operating procedures, stabilizers, causes of solvent contamination, solvent recovery, trouble shooting. Ask your distributor for a copy or write us.

Nialk® Trichlor, a product of

HOOKER CHEMICAL CORPORATION

1304 Union Street, Niagara Falls, New York

Sales Offices: Buffalo Chicago Detroit Los Angeles New York Niagara Falls Philadelphia Tacoma Worcester, Mass.
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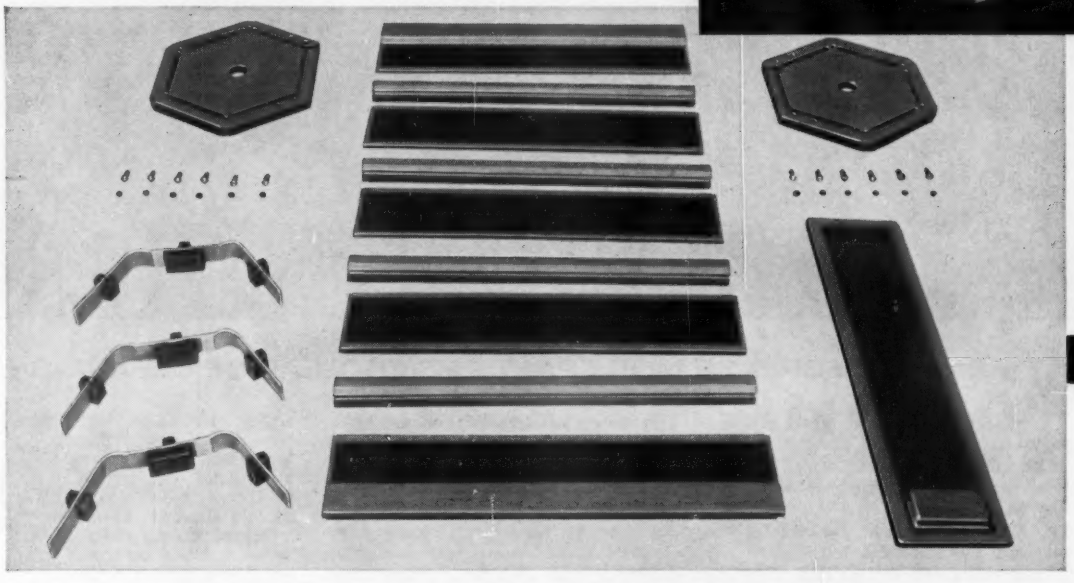
HOOKER CHEMICALS PLASTICS

BRAND NEW!

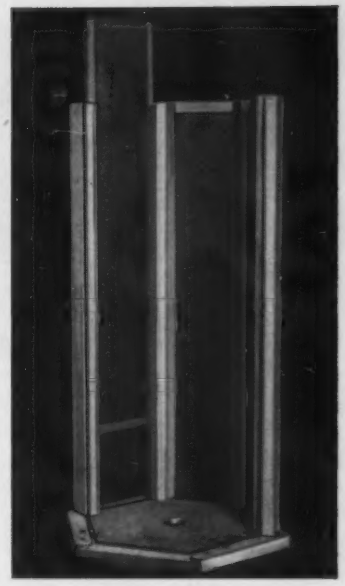
UDYLOK-TEMPRON CYLINDER AND BARREL ASSEMBLY

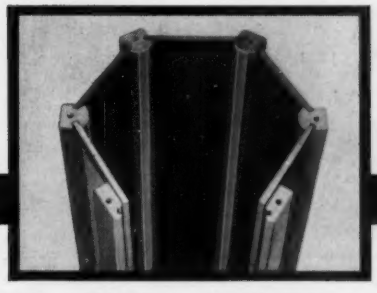


The all new Udylok Cylinder and barrel assembly—from Udylite of course—is loaded with built-in benefits that can be translated directly into dollars of extra profit for you. Two solid years of experimental research have resulted in noteworthy economies of efficient operation, long-lasting, simplified (repairable) construction and lower manufacturing costs . . . which are passed along as savings for you. Now, learn how you can profit with Udylok-Tempron Cylinder and Barrel units in *your* plant. Find out today!

YOU GET SIX BIG BARREL BENEFITS with this new Udylok-Tempron assembly

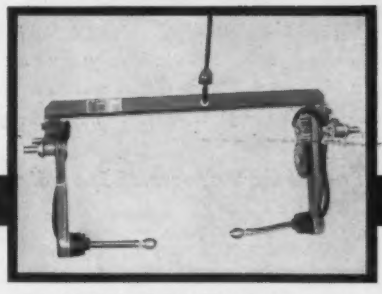
A plating cylinder so simple in construction . . . you can count on its long life expectancy and repair any damage with ease.



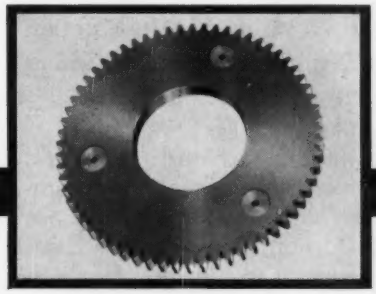


NEW INTERLOCKING CONSTRUCTION—No corrodible tie rods to rattle, work loose or get in the way . . . no old fashioned cemented joints. Exclusive interlocked rail and joint construction employs just 12 parts . . . no metal that will plate up in the entire cylinder unit.

NEW FIELD REPAIRABLE DESIGN—Standard parts are available from Udylite stocks, or you can stock spare parts and make your own repairs easily and rapidly with just a hammer and screwdriver . . . return cylinders to production in minutes.

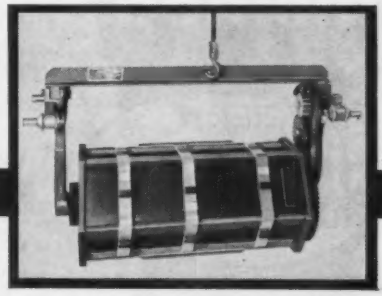


NEW UDYBILT SUPERSTRUCTURE—Combines new principle, dependable 4 saddle positive contact with 3 point suspension . . . never any misalignment . . . no arcing . . . gears are always in mesh . . . no jumping. Can be used with old style cylinders and in your present tanks.



NEW UDYLON RING GEAR—New four pitch gearing provides greater-than-ever strength and durability. It's super corrosion resistant . . . will not plate up . . . inert to all solutions. *New low list price,* too.

NEW FIBERGLASS DOOR CLAMPS—Special epoxy-fiberglass composition . . . engineered for extra strength . . . they're flexible, lightweight, impervious to heat, cold and corrosion. NO METAL PARTS. Nearly indestructible, even under abuse.



HIGH WORK LOAD and current capacity. Easy to repair, economical in initial cost and maintenance, the Udylok assembly is loaded with buyer benefits. When you switch to Udylok in your plant you make the perfect economy move.

NEW BELT DRIVE . . . Udylok is also available with an improved belt-drive-hanger. For additional information about either model, consult your Udylite man today or write:

the udylite **corporation**

detroit 11, michigan

world's largest plating supplier

on the west coast the: **L. H. Butcher Company**

Maximum Smoothness on Zinc Die Castings Obtained With OFHC® Anodes

Eliminate roughness by plating zinc die castings with *impurity-free* OFHC Anodes... and cut scrap loss too! Detroit Die Casting Corp. of Detroit, Michigan, finds that OFHC Anodes dissolve uniformly in copper cyanide baths, yielding smoother deposits on zinc die castings for automotive parts. *Even with cathode current densities varying from 30 to 60 amps per square foot.* And because OFHC Anodes keep producing up to the solution level, downtime for anode changeover is reduced. Detroit Die Casting credits OFHC Anodes for enabling trouble-free plating in extended production runs.

More Usable Copper Per Pound... Less Anode Scrap

OFHC Anodes are the purest copper anodes produced—99.99+% copper, the only copper anodes completely free of oxides and residual deoxidants. Their density is equal to that of rolled anodes. Purity and density result in more uniform dissolution, less scrap loss... *more usable copper per pound of anode.*

Free technical publications to help you obtain better plating—and at the same time lower costs—are available from your OFHC Anode Distributor, or directly from AMCO Technical Service Section. Ask for them today.

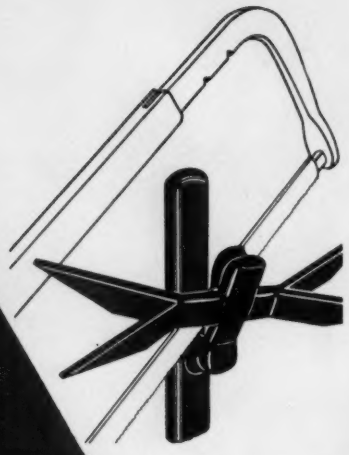
AMCO DIVISION
American Metal Climax, Inc.
1270 Avenue of the Americas
Rockefeller Center, New York 20, New York

New Heavy Duty Convertible Economy Plating Racks

from fixed tip to replaceable tip

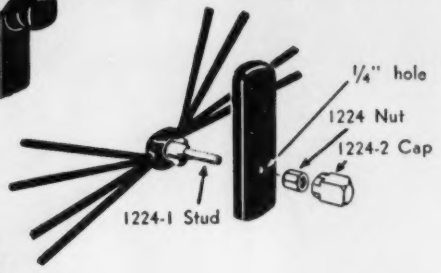
One letter designates Non-convertible Economy Rack

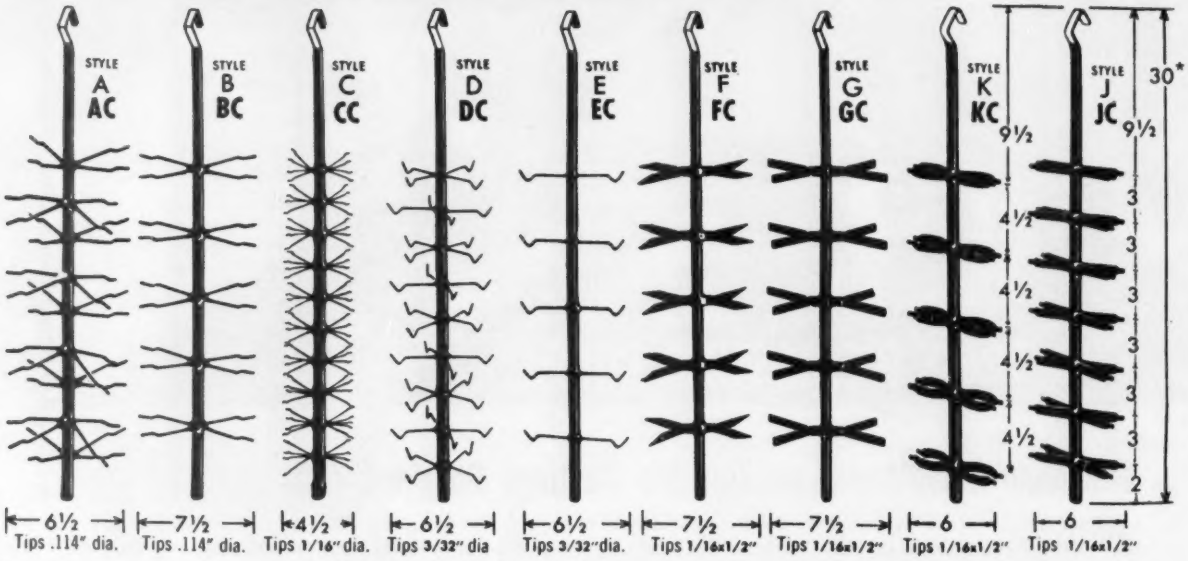
Suffix "C" designates Heavy Duty Convertible Economy Rack



Just saw off broken tips

Install ready-made Thinker Boy Tips





①	A $5.78	B $4.77	C $6.00	D $5.83	E $4.42	F $5.84	G $5.69	K $5.75	J $6.50
②	**AC 6.95**	**BC 5.77**	**CC 7.35**	**DC 6.95**	**EC 5.20**	**FC 6.95**	**GC 6.95**	**KC 6.95**	**JC 7.85**

① Cat. No. and Prices of Non-Convertible Economy Racks.

② Cat. No. and Prices of New, Heavy Duty, Convertible Economy Racks.

*36 inch lengths also available.

All prices F. O. B. Chicago, subject to change without notice.

Add $1.50 packing charge on orders for less than 12 racks.

No variations at these prices except in mass production quantities.

Developed in response to widespread demand for Economy Racks that could be kept at 100% capacity through endless years of use. These NEW Convertible Economy racks have special rivited tip assembly that is easily removed for replacement with pre-insulated, self-sealing THINKER BOY Tips.

The Convertible Economy Rack Spines are 25% heavier. Quality construction—mass production economies make possible the low prices.

Belke MANUFACTURING COMPANY
947 N. Cicero Ave., Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS

Revolutionary new industrial finish sprays on...stays on! all metals! all colors!

Lowe Brothers Ep-O-Spra looks like special metal finishes but actually surpasses them for durability, economy and ease of application. Resists just about everything—heat, acid, impact and abrasion, to name but a few. Applies without elaborate preparation or special equipment. Check this typical report from a leading manufacturer of outdoor furniture:

"No apparent failure of Ep-O-Spra Brass after 175 day test in Fad-ometer which is equal to 2100 days of outdoor exposure during the months of June, July and August."

. . . and Ep-O-Spra is just as much at home on appliances, business machines, metal furniture, outboard motors, bicycles and kitchenware—in fact, almost any product made from treated cold-rolled steel and bonderized metal, or any polished metal surface.

For information and samples, just send the coupon. A Lowe Brothers finishing engineer will visit you and demonstrate how Ep-O-Spra fits into your finishing picture.

LOWE BROTHERS INDUSTRIAL FINISHES

Quality unsurpassed since 1870

Style-tested paints for Home and Industry

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The Lowe Brothers Company (MF-4)
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☐ Please have my nearest Lowe Brothers Finishing Engineer call on me as soon as possible.

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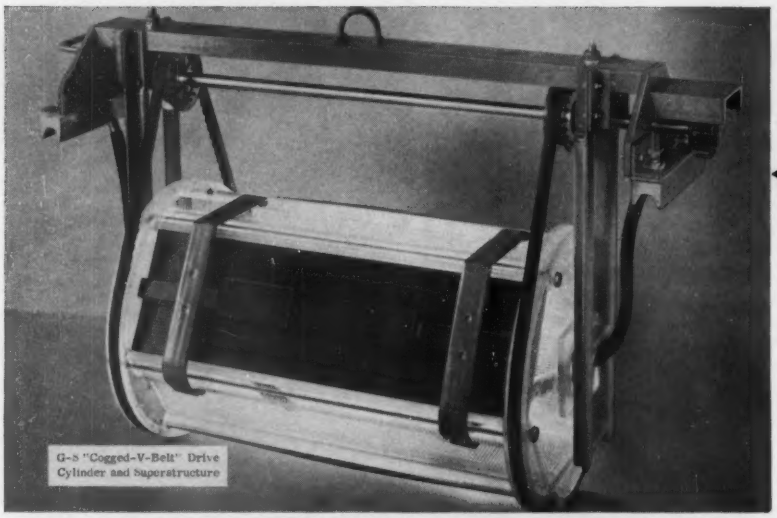
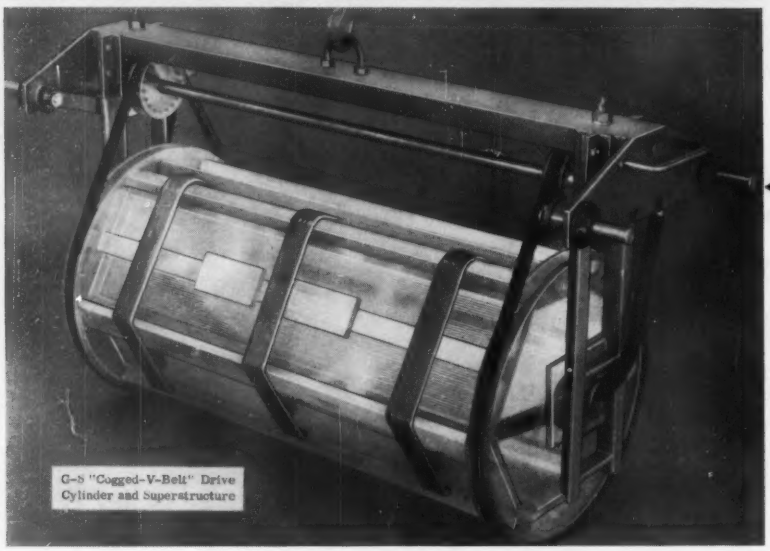


G-S "Cogged-V-Belt" Drive
Cylinder and Superstructure

G-S INVERTED-V

CONTACTS

Another G-S exclusive! 16" more contact area. Up to 30% greater current flow, self-cleaning. Attached to G-S floating end-plates for automatic corrective adjustment. Most positive contacts in barrel plating.



G-S "Cogged-V-Belt" Drive
Cylinder and Superstructure

G-S HORN-TYPE

CONTACTS

Models to fit all other makes of installations. Attached to G-S floating end-plates for automatic corrective adjustment. 3-point suspension for 4-point contact at all times. No rocking, no arcing. Prevents burned insulators.

NEW LIFE FOR OLD INSTALLATIONS

G-S Replacements Guaranteed to Fit Your Existing Equipment

Low-Cost, Unit-by-Unit Conversions Solve Changeover Problems

Don't delay your improvements for fear of high costs, shutdowns, etc. G-S replacement equipment permits you to convert gradually. A cylinder today, a superstructure next week, a tank and drive next month — to suit your situation. Each is guaranteed to fit your present installations. Each is proven performance leader in its class.

G-S Replacement Cylinders — to fit *your* superstructures. Exclusive heavy-ribbed, all-bolted or all-welded construction in H-T Plexiglas, Tempron, Polypropylene. Any combination.

G-S Replacement Superstructures — to fit *your* cylinders, tanks, and drives. Convert to famous G-S "Cogged-V-Belt" Drive. No gears in solution.

G-S Replacement Tanks and Drives — to fit *your* superstructures. Perfect super-performance adaptions for all makes, types, sizes, ages. Gives you new plant output.

G-S Replacement Equipment makes your old installations produce better than when new. Look into the new G-S Conversion Plan — it pays for itself in better, faster plating; less maintenance costs. **Send for catalog and prices, today!** *Manufactured by The Singleton Co.*

The G-S Equipment Co.

15575 Brookpark Rd., Cleveland 35, Ohio

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Northwest Chemical quality is equal to any in the field. Their formulas are based on careful research and long experience. The steady growth of the company and the acceptance of their products is due to the invisible ingredients compounded in each shipment going into a customer's plant.

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That is the reason Northwest Chemicals are specified by an ever increasing number of the country's top manufacturers.

Remember—the cost per finished article is the true cost of your cleaner. Northwest's stand-by service keeps the job right.

Licensed Manufacturers { **Alert Supply Co., Los Angeles, California**
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NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

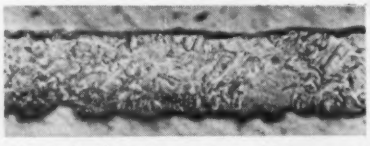
pioneers in pH cleaning control *serving you since '32*

Call Du Pont: for better top-quality chemicals... timesaving

Now... you can deposit a level coat of copper on metal parts

New process lowers finishing costs... improves appearance... provides an excellent undercoating for nickel and chromium.

1. Photomicrograph shows 0.001-inch copper plating on polished steel of 24 RMS. Conventional copper plating (above) shows uneven surface using direct current.



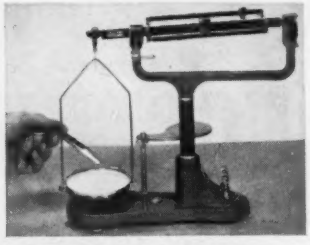
2. Du Pont's level-coating process with *interrupted current* shows amorphous structure and relatively level surface... satisfactory where maximum leveling is not required.

3. Same process with current reversal gives laminar structure, extremely level surface. *Current reversal* is employed where maximum leveling of surface is desired.

A combination of chemical additives and current variations form the basis of this new leveled copper plating method. Included are a high-efficiency cyanide copper bath and special Du Pont addition agents: Elchem 1396 and 1442M. The process can be easily and inexpensively adapted to most plating operations.

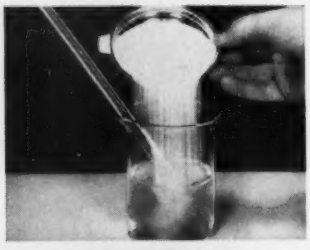
You'll avoid trouble and save time with new Du Pont double salts—

Sodium-Copper Cyanide and Potassium-Copper Cyanide

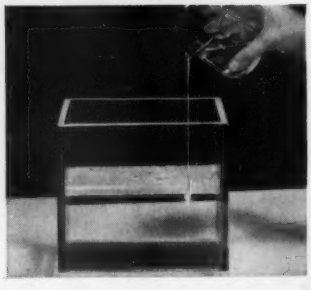


NEW DIRECT METHOD

1. You weigh required amount of Du Pont double salt instead of potassium or sodium cyanide *and* copper cyanide.



2. You dissolve double salt in water or plating solution. You eliminate steps of dissolving separate chemicals.



3. You add double salt directly to plating tank with no filtering necessary. Active ingredients are in proportions usually required. You save time, reduce handling, avoid waste and mixing errors.

The balanced composition of Du Pont double salts simplifies calculations required in making up new baths or replenishments. (1 oz. potassium-copper cyanide double salt equals 0.26 oz. copper, or 0.37 oz. copper cyanide; 1 oz. sodium-copper cyanide double salt equals 0.29 oz. copper or 0.41 oz. copper cyanide.) Both Du Pont double salts are packed in handy, moisture-resistant 100-lb. net fiber containers.

DISTRICT OFFICES

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Boston, Mass. ... 45 Fourth Ave., Waltham 54, Mass.	Cleveland 20, Ohio ... 11900 Shaker Blvd.	New York 1, N.Y. ... 350 Fifth Ave.
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Export Division ... Du Pont Building ... Wilmington 98, Delaware

electroplating at your plant... methods... dependable service

Two convenient forms of sodium cyanide 97%

ALL-PURPOSE CYANOBRIK®

—handy, pillow-shaped briquettes of 97% minimum sodium cyanide for all applications: plating, case hardening and chemical manufacture. Cuts inventory and purchasing problems. Made by a new Du Pont process, the briquettes are lower in moisture content and are more moisture-resistant than before.

CYANOGRAN® M

—granular, easily dissolved form of 97% minimum sodium cyanide. Ideal for dry compounding where uniformity of size is desired. "Cyanogran" M will pass through a 10 mesh screen; is retained on a 50 mesh screen. Absence of fines and dusting makes it easy to handle. It sells at the same low price as All-Purpose "Cyanobrik".

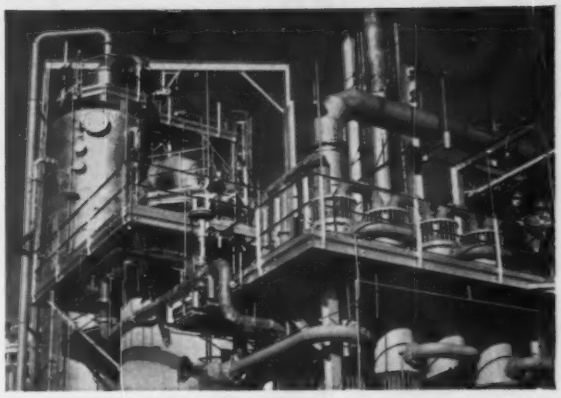
Du Pont sodium cyanides are highly suitable for cyanide electroplating solutions, including copper, brass, zinc and cadmium normally using sodium cyanide. Negligible sulfide content makes them especially attractive for use in sulfide-sensitive, bright copper baths. Specifications:

(NaCN-97% min.; NaCl-0.2% max.; Sulfides as S-0.0005% max.)

POTASSIUM CYANIDE

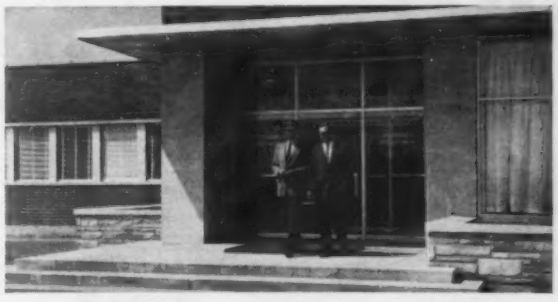
The extremely low sulfide content and high assay of Du Pont potassium cyanide make it ideal for all plating solutions in which potassium cyanide is specified. It is particularly suitable for use in modern bright cyanide copper, gold and silver plating baths. Specifications:

(KCN-98% min.; KCl-0.5% max.; Sulfides as S-0.0003% max.)



New modern plant assures reliable domestic source of supply

Centrally located in Memphis, Tenn., Du Pont's new chemical plant (above) is producing the high-quality sodium and potassium cyanides mentioned at left. This new source of supply means that you can depend on Du Pont to meet your needs quickly . . . at all times.



Technical service for you

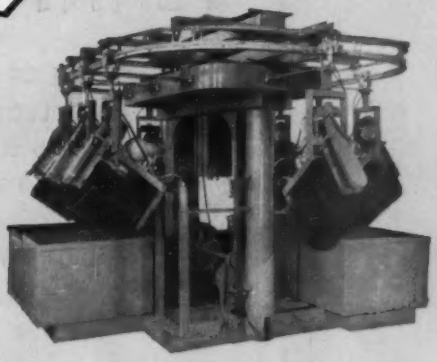
Du Pont's nationwide staff of technical field men is ready to assist you whenever you ask for help. They're backed by a 2-million-dollar Sales Technical Laboratory in Wilmington, Delaware. All lab facilities are at your disposal. For more information on Du Pont electroplating chemicals and timesaving processes, call your nearest Du Pont representative (see below).

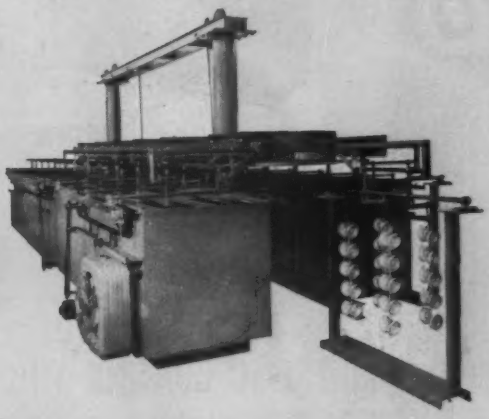
E. I. DU PONT DE NEMOURS & CO. (INC.)
ELECTROCHEMICALS DEPT.,
SODIUM PRODUCTS DIVISION
WILMINGTON 98, DELAWARE

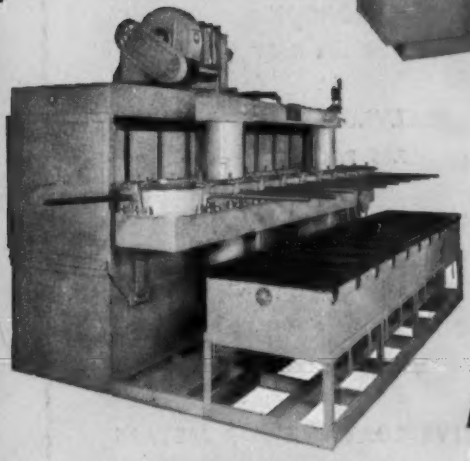
DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

CROWN AUTOMATICS



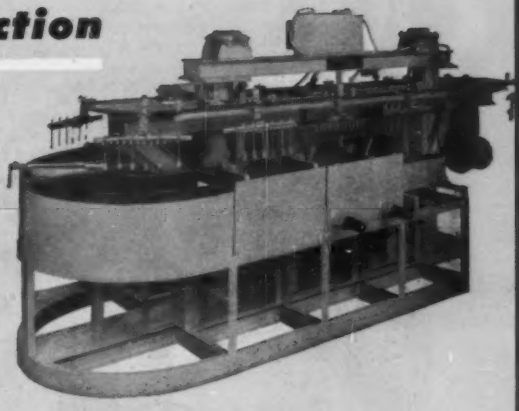


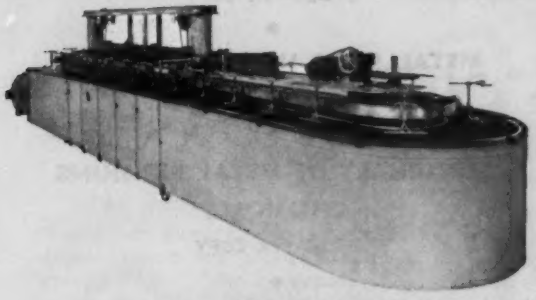


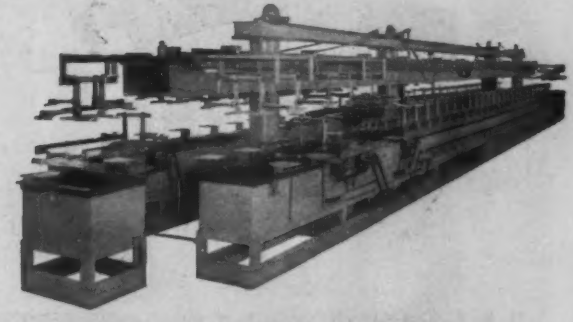
increase production

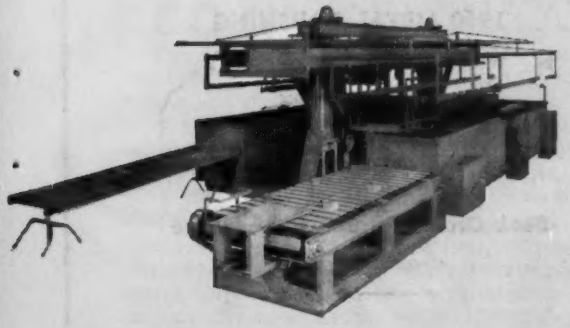
reduce costs

improve quality









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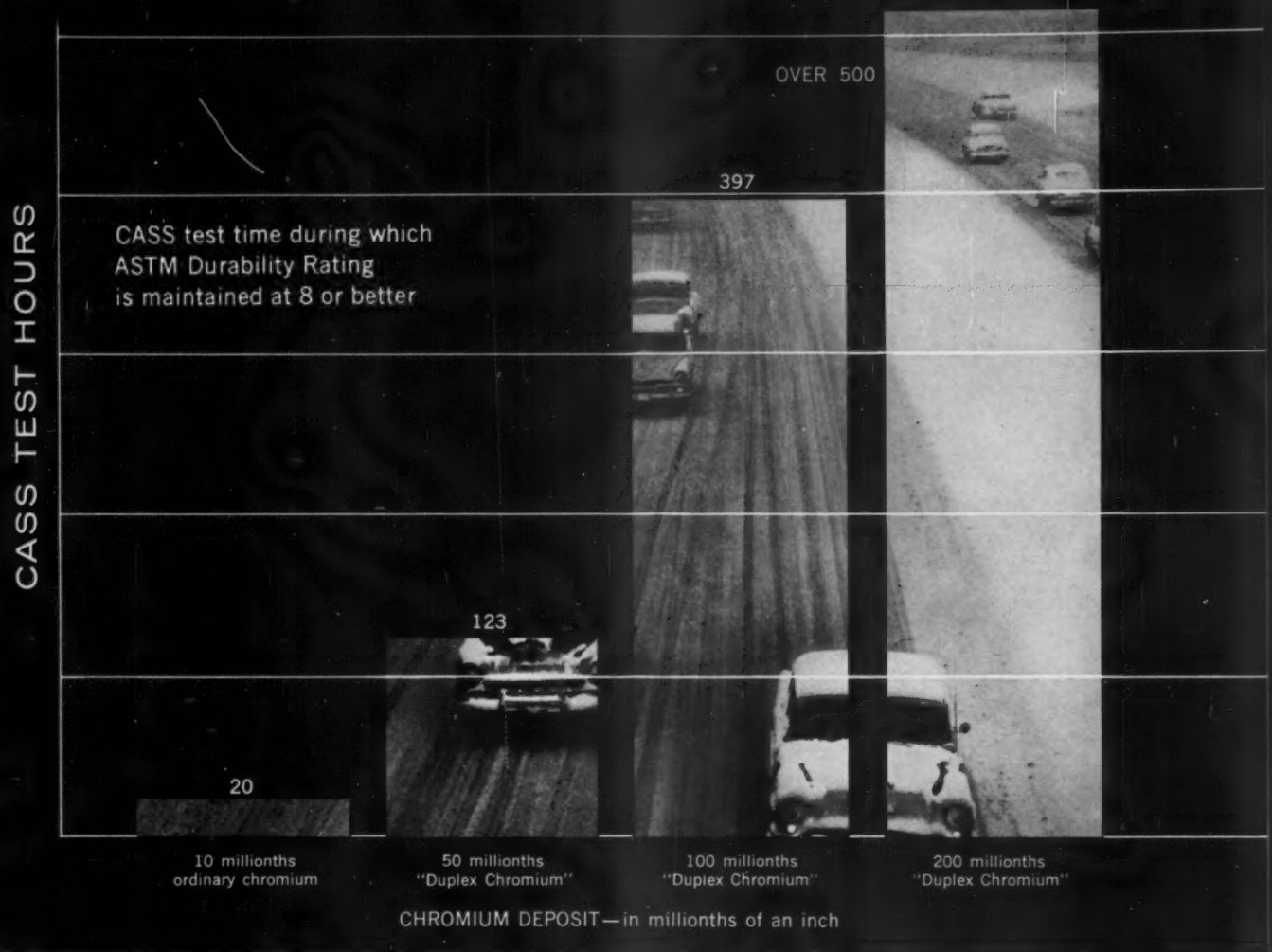

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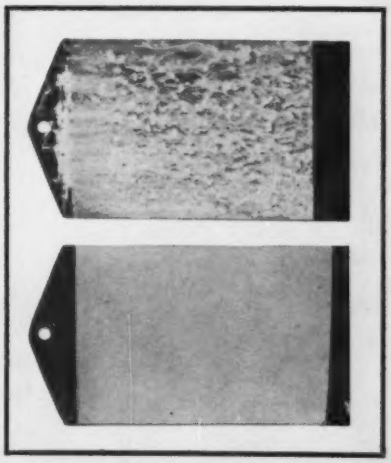
Send for an M&T plating engineer, or for literature.



Zinc die cast panels after 272 hours CASS test. Both had same copper and dual nickel undercoats. Top panel, plated with 0.01 mil ordinary chromium gets ASTM rating of 0. Bottom panel, plated with 0.10 mil "DUPLEX CHROMIUM" still rates a perfect 10.

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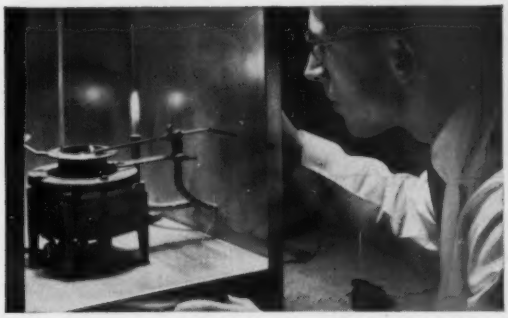

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WICHITA—Reid Supply Company (C P T)

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LOUISVILLE—Gans Chemical and Supply Company (P)
LOUISVILLE—McKesson & Robbins, Inc. (C M P T)

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OMAHA—McKesson & Robbins, Inc. (C M P T)

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ALBUQUERQUE—Edmunds Chemical Company (C M P T)

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CHARLOTTE—Southern States Chemical Co. (C M P T)
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AKRON—C. P. Hall Company (C M P T)
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TULSA—Chemical Products, Inc. (C M P T)

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PROVIDENCE—Sessions-Gifford Company, Inc. (C M P T)

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GREENVILLE—Southern States Chemical Co. (C M P T)
SPARTANBURG—Moreland Chemical Co., Inc. (C M P T)

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APRIL, 1960 Volume 58 No. 4

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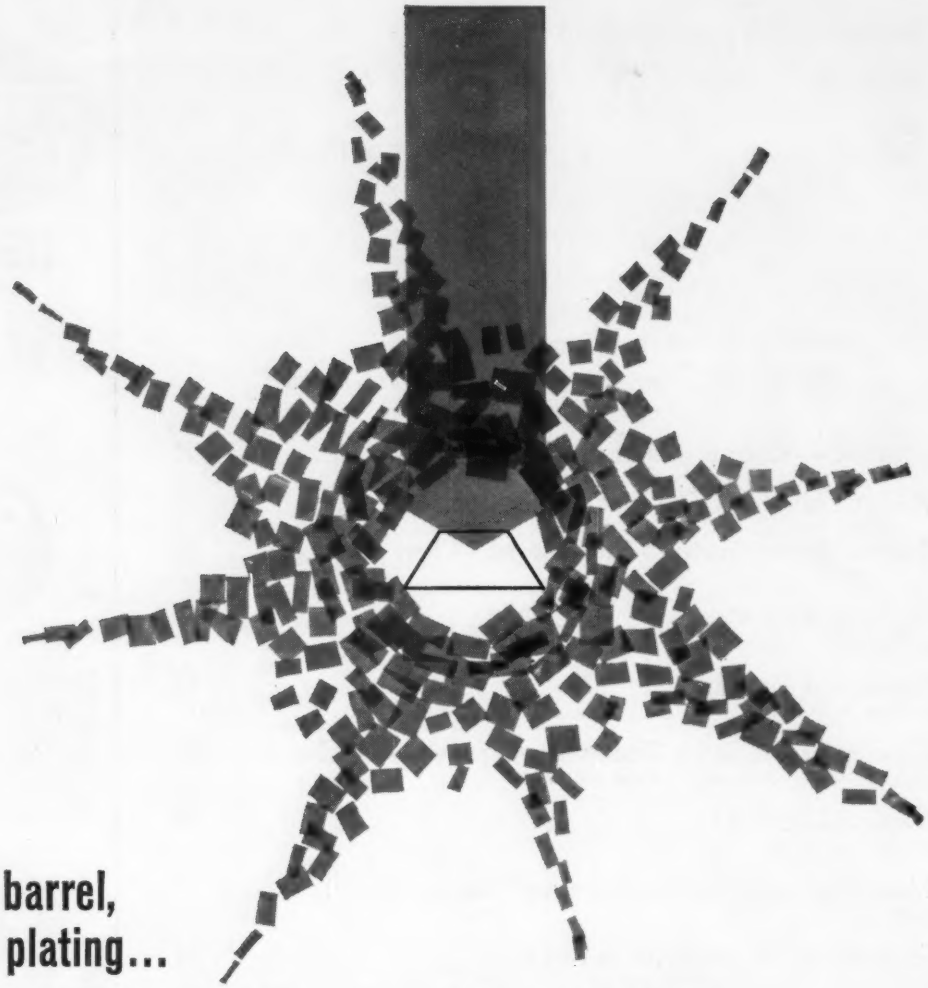

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ESTABLISHED 1903 VOLUME 58 • NUMBER 4 • APRIL, 1960

CODE OF ETHICS

After two years of research and preparation, the *National Association of Metal Finishers* recently completed what is probably the first attempt at an industry-wide code of ethics and trade practices. This code is not simply the concern of the job shop operator. The manufacturer who keeps him in business and the one who competes with him by operating a part-time captive shop are also deeply involved, and it is really for their consideration that we publish the code in this issue of METAL FINISHING. For, without their cooperation the whole effort becomes meaningless.

The job shop provides a service, which implies relatively small size; the one-hundred man shop is the exception rather than the rule. Small organizations do not often maintain cost-accounting systems, usually because they feel they cannot afford to, but also because of ignorance of the advantages, and they operate on a hit-and-miss basis. Of course, 'some of our best friends are job platers' but, unfortunately, the terms "job plater" and "business man" are not necessarily mutually inclusive. The former is liable to forget the wear-and-tear on his truck and other equipment, and the latter is apt to neglect anode cost when estimating. We are reminded of our favorite example, an electronic part of easily determined surface area, requiring a specification gold deposit which calculated to a metal cost alone of about two dollars. The lowest bid was $1.80, if we remember correctly. That is tough competition!

Just as there are specialists among auto mechanics, where one can reline brakes most efficiently, while another has the equipment for economical carburetor repairs, so there are job shops which can do some types of finishing at a lower cost than other shops. Without being a proponent of "fill-in" work, done at or below cost, we can recognize its justification under certain conditions. These, and other factors, will always insure a range of estimates, but the resulting competition will be healthy rather than ruinous, if only the new code is honestly adhered to.

We congratulate the N.A.M.F. on its heroic accomplishment and join in commending the code to our whole industry, for, clean competition is the basis of stabilization. The plater has a greater stake in quality finishing than does his customer, who can always switch to substitutes if necessary, but the manufacturer too is concerned lest his product be debased as a result of a job plater's attempt to cut corners in order to avoid a loss, after deliberately underbidding to obtain the contract.

Nathaniel Hall

A Metal Finisher's Ten Commandments

A Code of Ethics Adopted by N.A.M.F.

WHAT is believed to be the first attempt at an industry-wide code of ethics and set of trade practices was ratified by the board of directors of the National Association of Metal Finishers recently.

Intended primarily for the job plating industry, final approval followed close to two years of research and study by the NAMF ethical and standard practices committee under the leadership of a committee headed by T. Hyduke of Durable Plating Co., Cleveland. Much assistance came also from the 14 affiliates representing the industry's sole "management organization," but particularly from the Masters' Electro-Plating Association (N. Y.), Ohio Association of Metal Finishers, Chicago Electro-Platers' Institute, and the Plating Institute of Michigan.

The code of ethics is broken down into two parts or documents: 1) "A Metal Finisher's Ten Commandments," and 2) a detailed three-and-a-half page set of ground rules, both of which are published below.

Standard practices include 16 points which range from responsibility and liability to conditions and agreement regarding charges for special tools, racks, and fixtures. A complete set of practices is also published below.

Both code of ethics and trade practices have received proper legal review and clearance, according to the Association.

PURPOSE: To Foster Trade and Promote the Interests of All Engaged in the Fields of Electroplating, Metal Finishing, Buffing, Polishing, and Allied Arts.

For more honorable competition, recognizing the fact that in the conduct of our business, no individual or concern in any community can act without regard for his neighbors and competitors, and that while the spirit of competition has been so deeply imbedded in the human heart and so keenly sharpened by the methods of everyday life, as to cause it to enter into and influence every transaction. But at the same time, we believe there are methods of competition which are clean, honorable, and legitimate, whereby we can compete without wronging others and without demoralizing the business in which we are engaged.

This Association, therefore, adopts the following rules of conduct and recommends them to Metal Finishers and Allied Artisans everywhere.

As a member of the National Association of Metal Finishers, I hereby resolve that:

I. I am a Metal Finisher — one of the best, and that I will conduct my business truthfully and with justice to all.

II. I will respect my competitor.

III. I will always be honorable in my dealings with my customers by doing good work and giving good services without misleading advertising.

IV. I will appreciate and keep inviolate all information and help given to me.

V. I will do all in my power to have a reputation which will earn me the respect of my business associates, my customers, and my competitors.

VI. I will keep accurate cost and accounting records so that I may always compete on the basis of true cost and a fair profit.

VII. I will endeavor at all times to make a new entrant into the metal finishing field a good competitor.

VIII. I will not entice the good worker of my competitor to join my firm.

IX. I will not bear false witness against my competitor.

X. I will at no time be envious of my competitor's good fortune.

Code of Ethics

Recognizing the fact that in the conduct of our business no individual or concern in any community can act without regard for his neighbors and competitors, and that while the spirit of competition has been so deeply imbedded in the human heart and so keenly sharpened by everyday life as to cause it to enter into and influence every transaction, but at the same time believing there are methods of competition which are clean, honorable and legitimate whereby we can compete without wronging others and without demoralizing the business in which we are engaged, this Association adopts the following rules and recommends them to metal finishers everywhere:

Our Duty to Ourselves

1. TRUTH AND JUSTICE. The Code of Ethics best calculated to elevate the status of metal finishers must be evolved by the development of moral and intellectual manhood. We, therefore, firmly resolve to test every transaction by the standard of truth and justice.

2. TRUTHFULNESS AND STRAIGHTFORWARDNESS. Take advantage of no man's ignorance; see that employees are truthful and straightforward, and do not misrepresent nor overcharge the confiding.

3. HONORABLENESS. It is an absolute essential in competition that we prove ourselves as honorable in every particular as we would have our competitors be.

4. REPUTATION. Mix freely with intelligent and honorable members of the craft, study their ways and methods and endeavor to get a reputation in the community as an intelligent, honest, first-class metal finisher whom people can trust with their work.

5. COST SYSTEM. Every establishment should have a perfect system of ascertaining the actual cost of every job. Only in this way can the business hope to be relieved from the deleterious effect of "wild" prices. Such a system should not only ascertain the facts, but record them so that they can be referred to understandably in the future.

6. ACCURATE ACCOUNTING. No establishment should be satisfied with anything except the most exact and systematic bookkeeping.

7. IMPORTANCE OF OVERHEAD. The expense of doing business, such as the wear and tear of equipment, delivery costs, interest on money borrowed, bad debts, rents, taxes, insurance, bookkeeping, and all other items of expense, should be ever before our eyes, and we should never forget that these must be levied as surely on each particular job as its labor cost. Never, under any circumstance, should the total cost plus a fair profit be forgotten. We should feel here a double restraint: in the first place to sell below cost is foolish; in the second place, it is wrong.

Our Duty to Each Other

8. WELCOME YOUNG COMPETITORS. When a young competitor enters the ranks, welcome him as a new soldier to the field, and help him to any information and assistance which will enable him to overcome the difficulties we had so much trouble in surmounting.

9. HELP THE LESS EXPERIENCED. It should be a duty and a pleasure to impart to our less experienced competitors the knowledge we possess, so long as we are satisfied that the information generously given will be honorably used. In this way, the element of ignorance which does so much to demoralize the industry may be partially eliminated and one of the most dangerous factors of competition destroyed. Remember, that knowledge kindly imparted makes a business friend of one who would probably otherwise become a business foe.

10. YOUNG EMPLOYER. The young employer who starts with modest capital and does most of his own work, should ever remember the honorable nature of his calling and never make the mistake of supposing that because he does his own work he can do it for less than his neighbor who employs many. He should, rather, insist that the work which he does with his own hands will be better and, therefore, should command a higher price.

11. RESPECTING COMPETITORS. No metal finisher shall defame a competitor by falsely imputing to him dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representation, or by falsely disparaging the grade or quality of his goods or services. Never express an opinion with respect to another's work unless *all* the facts are known. No metal finisher shall procure any information concerning the business of a member which is properly regarded as a trade secret or as confidential within its organization, except with the consent of such member.

12. HELPING NEIGHBORS. If it is possible to help a neighbor out of an extra rush, do it cheerfully and divide with him the profit on the work. In this way, the temptation to add to productive facilities, oftentimes much too large for the work done in a given community, will very often be overcome.

13. ESTIMATES FOR CHECKING. When estimates are asked for by any person on work done by another finisher, with plain intent to find cause to allege unfairness in the price charged, they should invariably be declined. It is not safe to criticize any price until one is in possession of all the facts. The work itself when done does not say whether it was done by night or day, with a few or many alterations; these with many other unknown conditions may have controlled the price.

14. INJURIES BY ESTIMATES. In making estimates, we are shooting arrows in the dark, and many unwittingly wound some of our best friends when we have least intended it. If the aggrieved person thinks he has been injured by an estimate which has taken away a valued customer, his proper course is to seek an explanation, and he should always begin with the supposition that the injurious price has been made in ignorance of all the facts, by thoughtlessness or by mistake.

Prices and Estimates

15. ESTABLISHMENT OF PRICES. Every firm should have a thorough knowledge of what it costs to do business and should determine what percentage of profit it will be satisfied with. Based upon these two items, it should establish its prices for all work undertaken, whether secured by competitive bid or without a price being named in advance. A finisher should not make estimates for work that he cannot do and when he is devoid of experience in certain branches of finishing, he should not attempt to price them. It is always unsafe and often unjust to give prices upon a class of work for which the cost is not positively known and has to be guessed.

16. ASK FAIR PRICE. Always have the courage to ask fair remuneration for any work offered, resting assured that it will be more profitable to be without a job than to secure one in which there is a temptation to resort to questionable methods in order to avoid a financial loss in its execution.

17. WHEN ESTIMATES ARE REQUESTED. When requested to make estimates for work, or when submitting proposals in answer to advertisements, the finisher should endeavor never to lose sight of the fact that the only proper price is the one that he would make were the work entrusted to him without any estimates having been requested.

Our Duty to Our Customers

18. ADVERTISING. Our statements to our customers must be fair and honest. False, inaccurate or deceptive advertising concerning the grade, quality, quantity,

thickness or deposit, substance, character or nature of any industry process, cannot be tolerated.

19. Commercial Bribery. No metal finisher shall give, permit to be given or offer to give, anything of value for the purpose of influencing or rewarding the action of any employee, agent or representative of another in relation to the business of the employer, principal or party. This provision shall not be construed to prohibit free and general distribution of articles commonly used for advertising except so far as such articles are actually used for commercial bribery.

20. Equality and Honesty. No metal finisher shall secretly make or offer to make any payment or allowance of a rebate, refund, commission, credit, unearned discount or excess allowance, whether in the form of money or otherwise, nor secretly offer or extend to any customer any special service or privilege not extended to all customers of the same class.

21. Buyer and Competitor. The man who asks for a bid upon work and before receiving it shows the figures quoted by another bidder, should be marked: it can be depended on that if he will show you another's bid, he will show yours to a third party. He wants you to do the job if you will do it for less than anyone else.

Our Duty to Our Workers

22. Interest In Our Workers. In the conduct of our establishment, it should be our constant endeavor to solidify the financial condition of our workers. This interest in their welfare is the best method of assuring their loyalty and of preventing strikes which do untold damage to both the proprietor and worker.

23. Apprentices. When an apprentice is taken, it should be considered our duty, if he proves inept, to advise him to seek another line of trade. It often occurs that a poor finisher would have made a good blacksmith or shoemaker; therefore, either trade, as well as the worker, will be benefitted by taking him away from the trade for which he is not fit.

24. Assisting Apprentices. When we conclude that the apprentice we have taken is competent to learn the business and that he will learn it in such a manner as to reflect credit upon those who taught him as well as to himself, no effort should be spared to make him all he should be as a worker and a good citizen. By so doing, we add to our own happiness, his prosperity, and help the future generation of metal finishers along the troublesome road.

Standard Terms and Conditions of Sale

To be printed on reverse side of Quotation Form:

1—Quotations are open for acceptance thirty (30) days from issuance. After thirty days, prices and terms are subject to change without notice.

2—We reserve the right, at our option, either to reject work or to make an extra charge for finishing any base metal below our required standard.

3—We assume no responsibility for defective plating or other finish on materials or merchandise previously plated or finished by others. Such defective merchandise will be returned to customer for refinishing or, at our option, stripped and refinished in our plant at customer's expense.

4—In special or experimental processing and finishing, our charges are not contingent upon the success of the work or the benefit derived therefrom by the customer.

5—We assume no liability for any loss of or damage to merchandise or material while in transit to or from our factory, whether in trucks or vehicles owned by us, the customer, or any third person acting in our or the customer's behalf, or for any loss of or damage to said merchandise or materials while the same are in our possession for any cause whatsoever, including, but not limited to theft, fire, casualty, or act of God.

6—We warrant that processing and finishing shall meet customer's specifications *supplied in writing* with the order and that such processing and finishing shall be free from defect in material or workmanship. When customer specifies methods and procedures to be followed, we shall comply whether or not the desired result is indicated. We assume no responsibility for the correctness of such methods and procedures or the result when they are followed. We do not warrant that material furnished by customer is suitable or fit for processing and finishing.

a. No claim for shortage in weight or count, or defect in quality whether latent or patent, will be allowed unless presented in writing by certified mail within three (3) working days after receipt of material by the customer or the customer's consignee to whom it is delivered, the customer hereby expressly assuming the risk of discovering such shortage or defect within such time. Any material found upon inspection by us to be defective in workmanship or material will be refinished by us without charge upon delivery to us FOB our plant, provided that such materials are returned in the same condition as when originally shipped by us.

b. This warranty is expressly in lieu of all other warranties, express or implied. Our liability for any loss or damage of any nature, including, without limit, direct, indirect and consequential damage, is limited to the customer's cost of the material or merchandise or our processing and finishing price for such material, whichever amount is the lesser.

7—No claim will be allowed for shrinkage, expansion, deformity, rupture or other alteration of material in finishing, nor for breakage in straightening, except by special separate written agreement.

8—All quotations, orders or agreements, or any modifications thereof, are contingent upon and subject to any and all occurrences beyond our control, including but not limited to, strikes or boycotts (whether occurring at our factory, your plant or factory, the plant or factory of any supplier, either of the customer or of ourselves, or elsewhere), accidents, theft, fires, war, shortage of materials, or equipment, casualty, or acts of God, and we shall not be liable for failure to perform any agreement for such causes. Should we notify you of our inability to perform any agreement for such causes, you are required at your own risk and responsibility, and at your own cost and expense, to pick up at our factory the raw, finished or unfinished materials which we have, belonging to you.

9—Deliveries made by us within ten (10) days of

(*Continued on page* 61)

Science for the Coatings Technologist

Part XV. Dispersion

By E. S. Beck

This installment concludes Part XV of the series. The first half appeared in the March issue of *Metal Finishing*.—Ed.

Dispersing Agents

THESE are surfactants which may or may not be wetting agents as well. The chief function of a dispersant is to separate the individual pigment particles, and keep them separated. The dispersing agent is an additive, generally used in very small quantities, which improves the dispersing properties of the vehicle used in the paint.

The dispersing agent is essentially a charged molecule with one end or section polar and the other end non-polar. One end is attracted to the pigment surface, while the other end is oriented toward the vehicle. The wetting activity is the result of the hydrophobic properties of the organic portion of the molecule. If these are not powerful, there will be little wetting activity shown. The dispersing power may still be adequate, however. This depends essentiallly on the charges. If the molecule is ionic, the pigment particles will each be surrounded by like-charged ions. This will result in electrical repulsion, thus keeping the pigment particles away from each other and delaying agglomeration. Both anionic and cationic surfactants can be used in this way.

However, even non-ionics can be used. This is because non-ionics, while not definitely ionized, do show charged areas which can orient themselves in such a way as to produce a charged nimbus around the pigment.

The number of such materials which have been proposed and used in paints is legion. Their specific uses and applications seem to be largely a matter of trial and error. It seems to be impossible to predict in advance which given material will work well in a particular paint. This is probably owing to the great complexity of protective coatings as made today. The characteristics not only of the pigment but also of the resins, oil and even of the solvents must be considered; not to mention minor components such as stabilizers, driers, etc.

It is impossible to consider all, or even many, of the surfactants available. A few of the more important materials will be discussed. One of the earliest and still very widely used substance is soya lecithin. It is not a highly efficient wetting agent, although in some cases it gives a lower viscosity paste, and a shorter mixing time. It is a valuable suspending agent because of its ability to impart a charge to the pigment particles. By the same mechanism it is a useful dispersant in many cases. It occasionally causes a loss of gloss or a change in color in some paint formulations.

Another older yet popular material which is anionic is a sulfate derivative of succinic acid. It is an extremely powerful wetting agent and shows a reduction in paste viscosity with a great number of pigments and vehicles. It seems to have no anti-settling properties. It is a very efficient dispersing agent in many cases, but there are many other cases in which it shows little value. It is best used in alcoholic solution, as aqueous solutions may cause viscosity increases. In baking finishes, a yellowing action is frequently observed.

A good commercial general purpose dispersing agent was recently developed, admittedly not the best for any specific situation, but on wide utility. It is especially useful for white pigments, and works well in air-drying and baking alkyds. The philosophy behind its development was to save the paint formulator the labor of trying a number of materials on each formulation preparatory to selecting the best one for each job. The amount of work required to do so is prohibitive. A broad-range material, working in most cases to give at least some improvement, is a very handy tool for paint chemists who must usually produce formulations with speed.

In latex or water-based formulations, other types of dispersing agents are employed. The pyrophosphates are widely used as dispersing agents. Perhaps the term "sequestering agents" would be a more accurate description. They prevent flocculation by sequestering the dispersed particles and maintaining them in suspension. They are invaluable in latexes as they also sequester or precipitate traces of heavy metal ions which might otherwise interfere with the performance of the latex.

More conventional types of dispersing agents are used as well, both with or in addition to pyrophosphates. Where ionic surfactants are to be used as dispersants, attention must be paid to the acidity or alkalinity of the finished paint and also to the compatibility with emulsifying agents present in the latex itself. If the latex has been emulsified with an anionic

emulsifying agent, the addition of a cationic surfactant will produce precipitation.

Just as flushed or predispersed pigments in oils and resins are available for the use of producers of oil paints, so dispersed colors in water are available for manufacturing of water-based paints. These are stir-in or add-in products. The pigments which are wetted and dispersed with surfactants and water, are sold in slurry form. By use of colors of this type, the manufacture of latex paints is greatly simplified. It is quite common to prepared so-called tint-bases, which are then adjusted to the required color shade by the incorporation of dispersed pigments.

As some latexes (such as Neoprene) run extremely alkaline and others (such as polyvinyl acetates) run on the acid side, care must be used in the selection of surfactants which will perform under the proper conditions. Some surfactants will react or even precipitate certain vehicle constituents, such as casein, under unfavorable conditions. This makes it necessary to run careful stability tests before adoption of formulations.

One other type of material, frequently called a grinding aid, is the tackifying agent. This is not actually a dispersing agent, but a substance of a rubbery nature which increases the stickiness of a roller mill paste, giving better mechanical handling properties. It will be considered under roller milling.

The Grind Gauge

The development of grind gauges represents a great step forward for the technical side of the paint industry. Before the development and widespread use of these devices, the estimation of the quality of a grind was a delicate operation. Paint technicians formerly spread the dispersion into a thin film on one spatula with the edge of another spatula. Years of experience in looking at these films were required to develop the judgment necessary to pass upon the quality of the dispersion. No numerical or scientific treatment of results was possible, and comparison of degree of dispersion, especially by different laboratories was difficult or impossible.

A number of stop-gap approaches were developed during the 1930's, such as the North Standards. These were mixtures of a high-grade dispersion of zinc oxide to which were added different grades of abrasive extender to decrease the quality of the grind. There were six of these standard grades, which were compared against the unknown batch by spreading side by side a smooth surface. The term North Standard, as used today, is synonymous with Hegman Scale Values, to be described below.

The St. Louis Production Club introduced the first fineness gauge, which was quickly modified and adopted as a general-use instrument. The present-day form is known as the Hegman Gauge. This has gone through several modifications, but now seems standardized. It is essentially a block of steel with a channel ½" wide and 5" long cut into the center of it. The depth of the channel varies from 4 mils (0.004 inches) at one end to 0 mils at the other, the graduations being uniform. The channel is marked on the sides from 0 to 8 at uniform intervals. These numbers are used in rating the degree of dispersion.

The paint is applied to the channel, and spread down its length by means of a hardened steel slide. The channel is rapidly inspected for the presence of sandy or gritty particles, no matter how fine. The viewing is best done at a slight angle.

The point at which this grittiness is first visible is taken as the grind reading for the dispersion. Some operators tend to read in between the numbers, by giving such ratings as 6½, but the accuracy of the device is generally not considered to extend to these limits.

The principle of the device rests upon the tapered base of the channel. The slide cuts off the film of wet paint exactly level with the surface of the block. If there are any large or coarse particles present in the paint, they will protrude through the surface at the point where the depth of the channel becomes the same as or less than the thickness of the particles.

This can perhaps be better seen by means of a specific example. Let us assume that the particles of pigment in a coating are broken down no further than 1 mil in size. They will protrude through a film of the paint which is 1 mil or less in thickness. At the Hegman gauge reading of 6, the depth of the channel is 1 mil. So, the paint in question will have a Hegman (or North) grind of 6.

Grinds of 1-3 Hegman are extremely coarse, and suitable only for house paints, sanding surfaces, and other coatings where large particles are harmless or even desirable.

Grinds of 4-6 are in the intermediate range, and are suitable only for house paints, sanding surfaces, and 6 Hegman is the absolute minimum for a gloss enamel. If the enamel is to be applied at a film thickness of 1 mil or better at all times, a grind of 6 can be tolerated. If the film thickness may be less than 1 mil, a grinding of 6 will prove unsatisfactory, as particles 1 mil in size are present and will protrude through the film giving a rough or gritty appearance.

Grinds of 7 or above are suitable for high gloss enamels, even those which will be applied in thin films. However, since the Hegman value of 7 represents a channel thickness of ½ mil, paints which may be applied at a thickness less than this amount require a grind reading better than 7. It is possible to obtain dispersions which go right down to 8 with no visible appearance of particles.

The Production Club Gauge is a modification of the Hegman scale recommended by the Federation of Paint and Varnish Production Clubs. It is essentially the same instrument, except that the scale is divided into ten instead of 8 units. The existence of the two rating systems has caused a moderate degree of confusion in the paint world at times, particularly in view of the Hegman North nomenclature already covering identical scales.

While the instruments seem fool-proof, a definite technique must be developed in order to obtain reproducible results. Doubleday and Barkman[5] describe an acceptable procedure. Most important is to read the gauge instantly. As the solvent evaporates, the film shrinks, changing the true thickness of the film. The angle of view should be constant, between 20 and 30

degrees from the horizontal of the block held in the hand.

Other factors are the wear of the block, lighting, viscosity of the paint, etc. Use of visual standards is often helpful in determining the rating.

In reading the gauge, large, separate particles should be ignored. These are considered foreign material or dirt, and can be removed by straining. The actual grind rating is based upon the appearance of numerous particles at or near a particular level on the gauge.

Cleanliness can also be rated separately by noting the numeral at which significant amounts of foreign or coarse particles appear. As these tend to be rather scattered, a gauge with a wider channel is frequently used.

Many such modifications of the Hegman Gauge are available. Some models are made with two separate channels for double readings. Some are marked with both Hegman and Production Club numerals. Some are made with the entire channel space divided between numbers 6 and 8 for the accurate evaluation of very fine grinds.

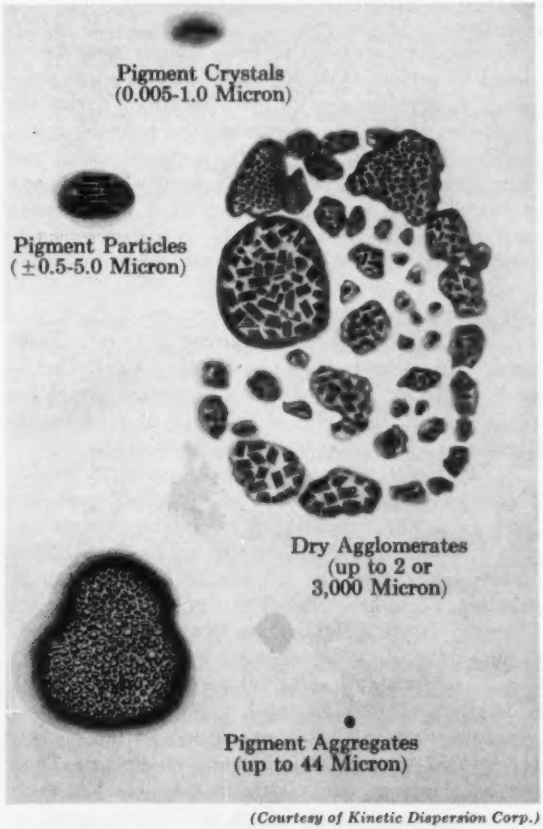
Properly used, the grind gauges have proven themselves to be extremely valuable instruments. By their means it is possible to express the quality or degree of fineness of a grind in terms which workers throughout the industry can understand. Research in dispersion technology has benefitted greatly because comparative grinds can be brought to the same degree of fineness with decent accuracy.

The gauges have proven of most value, perhaps, to the production and control men of the paint industry. It is now possible to specify the end point of a dispersion, and to hold production batches to the end point with good accuracy. So too, batches can be passed by the control laboratory with confidence about the quality of dispersion.

It must be emphasized, however, that recent work has shown that fineness of grind is not the only important factor of dispersion. With many formulations, all that is necessary is to achieve the requisite fineness of grind to obtain a good product. With others, however, further grinding beyond that required to obtain the desired fineness rating is necessary.

Pearce[2] attributes this to the need for wetting, which may not be completed by the time the desired fineness is obtained. In this case, further milling is needed to obtain a better, closer bond between the pigment and the vehicle.

Thus, like everything else in technical work, instruments and processes are not perfect, nor absolute. Some interpretation and creative thinking is usually necessary to obtain the best results under actual working conditions.



(Courtesy of Kinetic Dispersion Corp.)

Figure 3. Various Physical Forms of Dry Pigment. As pigment is first added to the mixer or mill, some of it may be in each of these states. During the dispersion operation, aggregates and agglomerates are broken down.

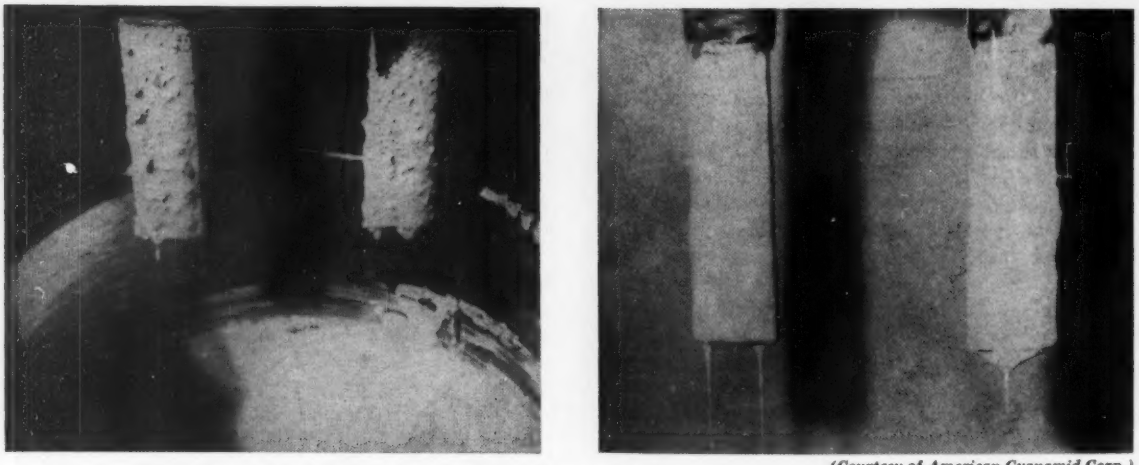
The Dispersion Process

We will now look at the process of dispersion a little more technically than we have done. The pigments are prepared almost always in a crystal form, running in size from 0.01 to 1.0 microns. These may be present in the individual state, but are more frequently clumped into larger units.

According to Candee[3] we can think of these larger units as consisting of three types: Pigment particles, pigment aggregates, dry pigment agglomerates. *Pigment particles* are built up from crystals at the time of precipitation, and range in size from 0.1 to 5 microns. These are usually the final state of the pigment as it appears in films. If these particles are broken down into the ultimate crystals, variations in color may occur. The size of these pigment particles is controlled by the pigment manufacturer, and is usually maintained small enough to be suitable for use in coatings.

The pigment crystals are held firmly into the particle structure by means of electrical charges. In fact, the charges holding the crystals together in particles may be as strong as those which hold the basic crystal itself together. In such cases, it would be impossible to produce a dispersion consisting of individual pigment crystals. Fortunately, the particle size can be controlled during the manufacturing process, so that useful sizes are produced.

The pigments are generally prepared in the wet state, and filtered out. The product of the filtration is known as the *press cake* because the pigment is put under a high pressure during the filtration. This press cake is still 80% water at this point. The pigment particles are completely agglomerated, but still individually wet with water. It is at this point that the operation of flushing can be performed. (We will consider flushed pigments shortly.)



(Courtesy of American Cyanamid Corp.)

Figure 4. Comparison of Weak with Intensive Mixes.

Figure 4a, above left, illustrates the lumpy pastes obtained when weak pastes are prepared. The viscosity at the time of first contact between the pigment and the vehicle is too low.

Figure 4b, above right, shows the smooth paste obtained when intensive mixing is used. The paste viscosity is very high during the first stages of the mix. See text.

For normal pigment use, the press cake is dried out almost completely. It shrinks to about a third its wet size, and is a solid mass of very large aggregates cemented together. This is then ground (dry) to a typical specification of 325 mesh. This means that the largest aggregate will be no more than about 40 microns in size.

It is during the formation of the press cake and the drying and grinding that the larger clumps of pigment particles are formed. Still following Candee[3] we find in the dry-ground pigment a very large portion of the original pigment particle size, but also, significant amounts of *pigment aggregates* and *dry pigment agglomerates.*

Pigment aggregates are the clusters we discussed earlier. A number of pigment particles, held together tightly by surface forces and also cemented together by means of the manufacturing process, form the aggregate. They will range in size up to about 40 microns. The number present will vary depending upon the nature of the pigment and the manufacturing process. The hardness of the aggregates will also vary with the same factors.

It is the pigment aggregates which give the greatest trouble in preparing dispersions in the paint industry. The whole technique is aimed at reducing these aggregates in size down to the original pigment particle which was formed during manufacture.

The dry pigment agglomerates are much larger clumpings of pigment than are the aggregates. The agglomerates are formed by the dry pigment during handling and shipment. They consist of very large groupings, for the most part loosely bound together. Some of these soft aggregates run as large as 6000 microns (¼ inch). They do not present much difficulty during the dispersion process, as the forces holding the agglomerates together are rather weak.

Wetting

The pigment clumps of whatever size are surrounded with an atmosphere of air. On the surface of the pigment there is not only adsorbed air, but also moisture and perhaps traces of inorganic substances picked up during the precipitation process and not completely removed.

During the dispersion process, this air must be replaced by vehicle. Hoback[4] classes pigments into three groups in accordance with their behaviour during the dispersion process. To start with, the pigment is surrounded by air (phase 1). During the mixing and dispersing operation, a stage can exist where clusters of particles surrounding air are mixed with the dispersing liquid (phase 2). Finally, in a successful dispersion, the pigment is wetted with the paint liquid (phase 3).

Hoback's three classes of pigments are:

1. *Pigments with non-adherent surfaces.* These pigments go directly from phase 1 to phase 3. That is, no intermediate stage of clustered masses containing air is formed. Examples of this type of pigment are Ultramarine Blue, Chrome Yellow and Silica.
2. *Pigments with adherent surfaces—fracturable.* This class of pigment, because of its adherent surfaces, tends to coalesce during the mixing process into masses containing air and surrounded by liquid. These masses are fracturable, and can be broken down by grinding. Some examples of this type of pigment are Titanium Dioxide, Molybdate Orange, and Phthalocyanine Blue.
3. *Pigments with adherent surfaces—plastic.* This is a group of pigments with undesirable dispersing characteristics. The adherent surfaces of the pigment promote the formation of clusters occluding air. These clusters, however, are plastic, not friable like those mentioned above. They deform rather than break up under grinding. Some examples are Iron Blue, Carbon Black and Toluidine Red.

The replacement of the air contained by the pig-

ment is accomplished by doing work upon the pigment in the presence of appropriate liquids. In the majority of dispersing operations in the paint industry, the replacement of the air is accomplished by means of shear. The only commonly-used mill which does not employ shear is the Kady mill. In shearing action, the mechanism can be pictured as a wiping of the surface with vehicle. The air is displaced, and the pigment wetted with the vehicle during the shearing process.

Candee[3] speaks of three methods of accomplishing wetting. First is shear, as mentioned above. The quality of the wetting obtained will be governed by the ability of the vehicle to wet the pigment; the nature of the adsorbed surface materials on the pigment face; and the relative cohering and adhesive strength of the vehicle. This latter must be greater than the forces holding adsorbed air on the pigment surface, or an incomplete replacement of air by vehicle will take place.

The second process of wetting listed by Candee is penetration. This is chiefly accomplished by soaking a pigment in solvent of good wetting or penetrating power for the pigment concerned. It should theoretically be possible to produce dispersions of pigment in solvent. The writer has yet to see any good dispersions of this nature except for the hydrated iron oxide mentioned earlier.

The third procedure is termed preferential wetting by Candee. In this process, the pigment is wetted by selecting a material which has a greater affinity for the surface of the pigment than does the adsorbed material on the surface of the pigment as it is delivered. Frequently, wetting agents are added to pigment mixes to obtain some degree of preferential wetting. The drawback of this procedure is that it is not general, but each system will require its own wetting agent for best results. This procedure is the basis for preparation of flushed pigments.

Dispersion

The most complex part of the dispersion process is the wetting of the pigment. The next stage (which can actually take place at the time) is the actual mechanical break-up of the agglomerates and aggregates. The greater the wetting power of the vehicle, the less mechanical work is required. The mechanical work may be considered as being necessary to reinforce the wetting properties of the vehicle. The work done by mixing or milling tends to overcome the attractive forces of the particles for one another, and allows the vehicle to do its work of wetting more effectively.

When a batch of pigment is thrown into a mixer or a mill together with oils and solvent, the surfaces of the pigment, being coated with an adherent layer of moisture, air, etc., are repelled by the oil. The result is the formation of rather large spheres of pigment aggregates which present a minimum of surface to the oil phases. Within these spheres is a substantial amount of moisture and air, mostly on the pigment surface. Simple mixing will not break these down and permit wetting and dispersion.

It is here that the mechanical work must be done. During the earliest part of the mixing, large agglomerates are built up. These must then be broken down by the grinding process. Depending upon the type of mixer or mill used, the mechanical work is done by attrition, impact, compression or shear, or some combination of these.

Hoback[4] and many others find that the best method of mixing to avoid formation of large agglomerates is by the use of vehicles of very heavy viscosity. This provides the necessary strength of film to give adequate shear. Hoback recommends use of extremely stiff pastes, made with viscous vehicles. He calls these intensive pastes, and the process intensive mixing. There are no visible lumps or agglomerates when pastes are handled in this way. Weak, or thin pastes, on the other hand, are lumpy, and are poor starting points for preparation of the dispersion. The milling time can be considerably longer and the final result inferior.

Stability

Once prepared, the dispersion must remain usable. It is possible to make dispersions where the pigment is adequately wetted and dispersed, but where the surface charges of the pigment have not been satisfied or removed. This type of dispersion will be very rigid or thixotropic.

Pigments dispersed in solvent are frequently very stiff mixtures, with no flow. This is owing to the attractive charges of the pigment particles. If a little oil or suitable wetting agent is added, the stiff mass rapidly becomes a mobile liquid.

In the more normal case, the dispersion will not be rigid but will contain some flocculation. It is generally true that a small amount of flocculation is desirable in producing a degree of thixotropy, especially in brushing or dipping paints. Systems with some flocculation also tend to settle soft, with easily redispersed sedimentation.

As mentioned earlier, substantial quantities of vehicle solids are useful in producing stabilization. The best way to obtain stability, however, is by the use of surfactants which impart a uniform charge to the pigment particles so that there is no attraction between them. This was considered under our section on surfactants, and needs no further discussion here.

It is an interesting fact that in dispersions of extremely fine particle size, with perfect neutrality of the particles (no surface charge) extremely hard settling will occur. Some structure in the vehicle, or a degree of flocculation of the pigment, or uniform charges on the surface of the pigment particles is required to prevent this.

Flushing

A respectable quantity of dispersed pigment is consumed by the paint industry in flushed form. This is done by the pigment manufacturer using the wet press-cake. If the press-cake is not allowed to dry out, the pigment particles are at or very near the original precipitation size. Hence there is no need for grinding if the pigment can be transferred to an organic vehicle without substantial change.

(*Continued on page* 71)

Applying Strip Coatings

By Thomas A. Dickinson

BY preventing damage and by serving as masking media, organic strip coatings have saved more than $50,000 during the past year at the Convair Division, General Dynamics Corp., San Diego, Calif.

Convair uses transparent and opaque types of strippable finishing materials which are applicable with cold-spray and hot-dip facilities. In general, they may be described as thermoplastics which have been compounded with plasticizers or parting agents so that their adhesion to a deposition surface is largely a matter of natural tension. Consequently, they can be readily removed by peeling action.

Their functions include the prevention of corrosion or aging in materials that must be stored or exposed to certain unfavorable conditions, the reduction of damage to materials being fabricated or handled, and the masking of parts which must be plated or otherwise finished only in certain areas.

A majority of strip coatings applied by Convair are transparent, since they permit the reading of numerals and other identification data stamped on the bare surfaces of materials or parts. Opaque coatings, which contain a black pigment, are normally used to protect parts against heavy abrasive forces.

Strip finishing dispersions made by several manufacturers are employed because of their respective abilities to shield differing materials — including most metals, plastics, and rubber.

Cold-spray strip coatings are usually applied with pneumatic equipment as indicated here, but in some instances they can be brushed on.

Prior to immersion in hot-dip strip coatings, parts are masked to keep finishing materials from holes or recesses and then attached to wires as shown here.

Immaculate cleanliness is obviously not essential to surfaces that will receive strippable films. However, Convair finishers have found that difficulties due to the premature separation of finishing materials can be avoided if deposition surfaces are at least superficially cleaned with rags soaked in appropriate solvents.

Where strip coatings are applied with cold-spray equipment, passes are made in such a way that films — free from bubbles, pinholes, dry spray, or sags — will be 0.001″ to 0.003″ thick. Consistent edge thicknesses of finishes are obtained by spraying well across and beyond deposition areas.

If defects like pinholes or dry spray are observed, spray pressure is reduced. Conversely, higher spray pressure is indicated when a coating has a tendency to sag.

When the atomization of finishing materials is impractical, as in masking certain parts, cold-spray strip coatings may be applied with brushes. Gun applications

Metal parts are dipped in a thermostatically controlled melting pot containing strip coating heated to about 350° F.

are preferred in all other circumstances because uniform film thicknesses thereby obtainable will facilitate eventual stripping operations.

All hot-dip coatings used by Convair are transparent and primarily suitable for the protection of such things as small parts and tools. They are heated in thermostatically-controlled melting pots to 350° ± 10° F. in order to maintain maximal fluidity without producing disagreeable smoke and fumes.

Parts to be dipped are cleaned much the same as if spray finishing were indicated, and small holes or recesses therein are subsequently covered with masking tape to facilitate the eventual removal of strippable finishes. Then wires are attached to projections or edges of the components so that each can be appropriately immersed in the heated coating solution for a period of about a second.

Following its removal from a finishing melt, a given part is held for a minute or two so as to allow excess materials to drip back into the dip pot. Thereafter, teardrops that may have solidified on the part are removed with a sharp knife.

Hot-dip melts sometimes become heavily contaminated with foreign matter such as dirt and metal particles, but their usable constituents can nearly always be reclaimed by straining them into clean containers. In addition, it is frequently practical to remelt and reuse hot-dip materials that are cut or stripped from various parts.

Accepted practice in the removal of Convair's strip coatings involves the breaking of a film with a sharpened piece of micarta, and then manually peeling material away from the break. Solvents and metallic cutting tools such as knives are not used due to the obvious possibility of scratching or the incomplete removal of coating resins.

As a rule, strip coatings are removed when parts must be heat treated, polished, plated, or finished with other materials — not where such operations as drilling, dimpling, or riveting are specified.

A METAL FINISHER'S TEN COMMANDMENTS

(*Continued from page* 54)

the time specified shall be deemed in full compliance with our agreement. It is agreed that we shall have the right to make partial or installment deliveries, for which the customer shall pay at the contract price. Defective delivery or non-delivery with respect to any installment or partial delivery under this contract shall be a severable breach and shall not give the purchaser the right to treat the entire contract as breached.

10—Any cancellation of order by customer shall be valid and effective only if accompanied by payment of an amount equal to twice the cost of actual labor and materials we have devoted to performance of the order, if any, plus ten per cent of the total contract price. Such amount shall be as and for liquidated damages and not as a penalty.

11—All customer's merchandise in our possession shall be subject to a general lien for all monies owing by the customer to us, whether or not due or payable, and whether or not such monies are owing to us for work, labor or services rendered, or materials or equipment used in connection with such merchandise.

12—Special tools, racks and fixtures required for the performance of the work described herein designated and built by us shall be and remain our property whether or not customer is charged for time and/or material in connection herewith.

13—During storage and transportation of customer's material, customer's containers used for delivery to us shall be used and any damage resulting from such containers shall be at the customer's risk. Should customer desire other packaging or containers, we will charge for material and handling and will provide such service upon receipt of written order.

14—Accounts will be due and payable on the 10th of the month following date of invoice, subject to the cash discount as indicated in the invoice, if any. Accounts not paid according to due date, which run into the succeeding month(s) will be subject to a service charge of 1% per month until paid. The 1% service charge will be added on the last day of the month following the date of invoice and monthly thereafter until the account is paid.

15—The provisions hereof constitute the entire agreement between the parties. Any changes, alterations, waivers or modifications with respect either as to the job performed or the terms of sale, or any other matter set forth herein must be in writing, signed by a duly authorized representative of the company. These terms and conditions shall apply to any order or agreement for the processing of any materials or merchandise.

16—These Standard Terms and Conditions of Sale have been accepted as standard practices of the industry by the National Association of Metal Finishers.

Conversion Coatings

Oxide Films

By Lester F. Spencer
Technical Advisor, Nuclear & Centrifugal Pump Div., Allis Chalmers Mfg. Co., West Allis, Wisc.

This completes the series on Conversion Coatings. The article on Phosphate Films appeared in the November 1959 issue, and the one on Chromate Films in the January 1960 issue.—*Ed.*

WITH the exception of the phosphate coatings, black oxide films are the most widely used conversion coatings for iron and steel. The coatings produced are black, adherent ferro-ferri oxide films ($Fe(FeO_2)_2$), that have moderate corrosion resistance to outdoor weathering and salt spray. However, they are not usually intended for this purpose and, if they are to be used under such conditions, they should be given a protective coating of oil, lacquer, or wax. The luster of the coating depends upon the surface condition of the steel prior to treatment. Glossy finishes are obtained on highly buffed steel surfaces, whereas, dull finishes are obtained on etched, brushed or sand-blasted surfaces.

Black oxide coatings offer several advantages which would include (a) low cost and simplicity of operation, (b) low coefficient of friction and non-galling properties when oiled or waxed, (c) small dimensional change and (d) attractive appearance. Of the various methods available to produce a black oxide finish, the aqueous alkali-nitrate solution is the most frequently used. After suitable cleaning procedures to obtain a reasonably clean surface, treatment is effected by immersion in a highly alkaline solution containing strong oxidizers and other rectifying chemicals; the bath being at a specified concentration and temperature. Since it is but an oxidation process, the dimensional changes involved in blackening are extremely small, being less than 0.00001 inch. The thickness of coating produced may range from 0.00006 to 0.0001 inch. A greater coating thickness may be obtained by prolonged immersion, but there is the danger that a loose film of black oxide will form and may also be quite easily removed subsequently.

The corrosion resistance afforded by any blackening process on steel is relatively low since there is no electrochemical protection. The iron exposed to the solution is converted to an iron oxide, but carbon particles and other non-iron aggregates are not converted. As a result, the degree of protection obtained will depend somewhat upon the carbon content and the impurities present in the steel. Highest protection is afforded to low carbon steels. It should be understood that there are definite limitations to the corrosion resistance of black oxide coatings.

Due to the high alkalinity of the blackening solution, care should be taken that the bath is not contaminated with zinc, aluminum, cadmium, copper, etc., since this will affect the color if present in sufficient amounts. A dip in 0.06 to 1 oz./gal. chromic acid for a few seconds is frequently used after blackening and rinsing in order to neutralize the alkaline film. This is particularly important where the work is to be oiled or finished with lacquer or enamel. The inclusion of the neutralization step frequently increases the salt spray resistance afforded by the subsequently applied oil.

A typical material flow would include:—(a) alkali clean and rinse to "no water break", (b) pickle to remove rust and scale, using a 50% aqueous solution of muriatic acid, (c) after rinsing, immerse in blackening solution, (d) rinse and dip in chromic acid neutralizing solution, (e) rinse and dip in hot soluble oil or, (e) dip in hot water and dry, and (f) oil, lacquer, or wax.

There are quite a few processes available for browning steel, this method being basically a rusting process in which a clean metal surface is swabbed with an acidic solution and, after drying, is exposed under conditions of controlled temperature and humidity. Under these conditions, rust will form. The surface is rubbed down to remove the loose rust and the process repeated several times, after which an oil dip is applied.

The variation existing in the browning of steel is usually in the formulation of the browning mixture. Other variations would be in manipulation or in the atmospheric conditions, artificial or natural. In general, the longer processes involve relatively low temperatures and low humidities, and the shorter processes, which are the preferred, involve relatively higher temperatures and humidities. Typical browning solutions are given in Table 1.

Gunmetal finishes used on small firearms and component parts on typewriters and calculating machines may be obtained by placing the pieces in a retort furnace with a small amount of charred bone and heated to a temperature of 700 to 800°F. After the work-pieces have been thoroughly oxidized, they are allowed to cool to about 650°F. A mixture of bone and about two tablespoons of carbonia oil are added, with heating continued over a period of several hours. The work-pieces will have a grayish black color which may be changed to a uniform black finish by dipping in a suitable oil.

A widely used method, and probably one of the oldest procedures, is the use of heat to produce the desired color on iron and steel. As indicated in Table 2, the color will depend upon the temperature of treatment. Oven heating is frequently used, but it is difficult

TABLE 1
***Percentage Composition of Browning Solutions*[27]**

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Ferrous chloride	----	----	----	----	----	----	----	----	----	0.9	----	----	----
Ferric chloride	3.9	2.8	8.9	2.1	2.8	7.0	----	----	5.3	2.8	3.3	22.2	----
Mercuric chloride	1.2	----	----	0.7	----	----	3.3	4.5	----	----	----	----	10.0
Cupric chloride	----	----	----	----	----	0.5	1.7	----	----	----	----	----	5.0
Antimony chloride	----	----	----	----	----	----	----	----	----	----	----	22.2	----
Bismuth chloride	----	----	----	----	----	----	1.7	----	----	----	----	----	5.0
Hydrochloric acid	----	----	----	----	----	7.5	9.9	----	----	----	----	----	30.0
Ferrous sulfate	----	1.5	----	----	----	----	----	----	----	----	----	----	----
Cupric sulfate	0.6	----	----	0.7	1.5	----	----	----	1.8	----	2.5	----	----
Nitric acid	1.8	8.5	----	6.4	8.5	4.3	----	----	2.2	0.5	3.7	----	----
Spirits of niter	6.2	----	----	----	----	----	----	----	----	----	4.1	----	----
Ammonium chloride	----	----	----	----	----	----	----	4.5	----	----	----	----	----
Alcohol	4.0	3.2	40.1	2.4	3.2	78.2	----	----	2.6	1.4	3.7	----	25.0
Gallic acid	----	----	----	----	----	----	----	----	----	----	----	11.1	----
Iron filings	----	----	----	----	----	2.5	----	----	----	----	----	----	----
Water	82.3	84.0	51.0	87.7	84.0	----	83.4	91.0	88.1	94.4	82.7	44.5	25.0
Approximate cost per gallon	$0.90	$0.27	$1.45	$0.35	$0.30	$3.38	$0.86	----	----	----	----	----	----

to maintain a uniform color due to fluctuations in temperature. Better temperature control may be realized by the use of a molten lead or salt bath. In both methods, the work-pieces must be thoroughly cleansed and dried before coloring.

Blue-black and black oxide coatings are obtained by salt bath immersion. Bath compositions may consist of either the nitrate salt mixture, the alkali-nitrate, or the dichromate; this latter salt type is considered to be the most consistent and easiest to use method in the blackening of stainless steel.

The nitrate bath may consist of equal percentages of both sodium and potassium nitrate; however, sodium nitrate alone is an excellent coloring medium although higher operating temperatures are necessary. A 1.0% by weight addition of manganese dioxide is frequently made to impart an additional oxidizing effect and permits the settling of suspended matter to the bottom of the tank as sludge. The temperature of operation may vary from 600°F. upward depending upon the composition of the salt and an immersion time that is seldom longer than 5 minutes. Since it is an oxidation reaction, the time of immersion must be pre-determined to obtain a desired color. Immersion times that are excessive will result in a dirty gray color. In addition, the color depends on the bath temperature; a darker gun-metal blue may be obtained at temperatures about 1000°F.

The molten alkali-nitrate mixture, when used at 900 to 950°F., produces a black oxide finish. However, this method is extremely hazardous and is not normally recommended.

In the steam process, the steel is placed in a retort and heated to a minimum temperature of 600°F. At this temperature, the retort is purged with steam. In the case of high speed steels, the temperature is much higher, usually 1000 to 1050°F., in order to carry out the temper-coloring operation.

Coatings for Copper Base Alloys

The black cupric oxide coating on copper base alloys containing 65% or more of copper gives good protection against salt spray, especially when augmented by means of oil, lacquer or wax. It also serves as an excellent base for organic finishes, in anchoring the coating and inhibiting reaction between basis metal and organic finish. The jet black coating, which is chemically and heat stable to 400°F., is obtained after a 2 to 10 minute immersion in a hot caustic alkali solution containing strong oxidizing agents.

Almost all alloys containing from 65 to 100% copper can be blackened, but certain elements such as tin, beryllium, and silicon may interfere with good blackening. When the copper content of the alloy is 90% or more, direct blackening can be accomplished after cleaning and acid dipping. With lower copper content, an activating treatment must be given prior to immersion in the blackening bath.

Both bright and dull finishes may be obtained. For bright finishes, the work is first buffed to a good luster, cleaned, blackened, rinsed, and dried. The highest luster and the deepest black are obtained by coating the surface with a high-bodied, clear baking enamel. Less glossy but attractive surfaces can be produced by wiping the coated surface with an oiled cloth or tumbling in an oiled material such as sawdust, leather meal, cork, or wooden pegs. Dull finishes are obtained by first dulling the surface of the metal to be treated by fine sandblasting, sand rolling, the use of a greaseless compound, or etching. The work is then blackened and coated with a wax emulsion.

TABLE 2
Temper Colors

Deg. F.	*Color*
400	Faint straw
440	Straw
475	Deep straw
520	Bronze
540	Peacock
590	Full blue
640	Light blue

The thickness of a black oxide coating may range from 0.05 to 0.2 mil, and the dimensional change normally expected will be in the vicinity of 0.5 mil. The coating is extremely adherent and will withstand considerable handling and wear. An indication of its corrosion resistance may be given by the salt spray test; the bare coating withstanding from 15 to 20 hours of exposure before green salts appear, whereas, coatings protected with a hard wax or oil will withstand over 200 hours of salt spray before breakdown.

Since these solutions contain caustic alkali with strong oxidizing agents, care should be taken that either the solution or the solid salts of a proprietary mixture does not come in contact with any organic matter, and definitely should not come in contact with any chemical reducing agents such as sulfur, phosphorus or sulfides, since there may be danger of ignition or explosion. Clean steel or stainless steel shovels, scoops, containers, and stirring rods, should be used along with protective clothing when making additions of salts or when operating the bath, including face shields.

A number of other colored finishes may be realized on copper and brass[27, 28] which may be briefly given as:—

(1) Royal copper on copper is obtained by immersion for about 20 seconds in a molten solution of potassium nitrate.

(2) Reddish-brown to dark brown, also referred to as statuary bronze, is obtained on copper and yellow brass copper plated by immersion of the work pieces in either of the aqueous solutions listed below. The depth of shade is controlled by the strength of the solution and the time of immersion.

	Solution A	*Solution B*
Liver of Sulfur	¼-2 oz./gal.	¼-2 oz./gal.
Ammonia	¼ "	-----
Caustic soda	-----	3 oz./gal.
Operating temp.	Room	170°F.

(3) A steel black coating may be obtained on copper by immersion in a solution containing 4 oz. arsenious oxide, 8 fl. oz. hydrochloric acid, and water to make 1 gallon. The solution is used at 180°F. and the work-pieces remain in the bath until a uniform coloration appears.

(4) A brown coloration on yellow brass is obtained by a one-minute immersion in a solution of sodium dichromate and nitric acid.

(5) A blue-black coloration on yellow brass may be produced in a solution containing 1 lb. copper carbonate, 1 qt. ammonium hydroxide, and 3 qts. water. The solution is used at 175°F., with an immersion time of about one minute.

(6) A gold coloration on yellow brass may be obtained by a one minute immersion at 70°F. in a solution of sodium dichromate, nitric, hydrochloric, and sulfuric acid.

(7) A light green coloration on yellow brass may be obtained by a 40 to 60 minute immersion in a cold solution containing sodium dichromate and phosphoric acid.

(8) A steel gray coloration on yellow brass is obtained by a 5 to 10 second immersion at room temperature in a solution containing arsenic trioxide, hydrochloric, and sulfuric acids.

Coatings for Zinc and Cadmium

There are a number of proprietary oxide coatings available for zinc and zinc alloys, as well as for electroplated and hot-dip zinc coated products. The coatings formed are from 0.00004 to 0.00008 inch thick and will normally withstand handling and wear. They are excellent for indoor use or for exposure to mild atmospheres. However, if outdoor weathering is anticipated, the oxide finish should be protected with wax, oil or lacquer. It serves as an excellent base for air dry painting, lacquering or enameling.

The appearance of the finish obtained is dependent upon the surface preparation of the metal. A glossy black finish can be obtained on zinc die-castings by buffing. However, if the casting surface is too porous, a brush finish may be preferred since it tends to obscure the pores. The best method of brushing the casting is to use a cloth wheel with greasless compound. Electroplated zinc surfaces require no prefinishing unless the deposit is rough or varies in brightness. Usually, the minimum thickness of about 0.0002 inch of zinc is necessary to obtain satisfactory blackening. In addition, deposits from bright zinc solutions may be difficult to blacken in some proprietary solutions. Reducing the brightener concentration generally overcomes this difficulty.

Both cold and moderate temperature baths are used for blackening. A typical sequence of operations in processing zinc-base die-castings is as follows:—(a) buff to a bright finish; (b) remove buffing compound by vapor or vapor-solvent degreasing, or by emulsion cleaning; (c) rinse where emulsion cleaners are used; (d) alkali clean to remove traces of oil and grease; (e) rinse in cold water; (f) acid dip for neutralization and activation; (g) rince in cold water; (h) immerse in blackening solution at a temperature between 150 to 180°F. for 5 to 8 minutes; and, (i) rinse in running cold and hot water, followed by drying.

In general, the formation of a black oxide coating will increase with higher concentration of salts within the bath and with higher temperature. With some proprietary compounds, a concentration and temperature should be selected so that blackening does not occur too rapidly. Thus, too rapid a treatment as well as a lengthy immersion in the blackening solution may tend to produce granular and non-adherent coatings. Off-colors usually may be traced to thin coatings, improper cleaning, and an unbalanced bath. Proprietary compounds are available for plated cadmium, which are similar to those developed for zinc coated surfaces.

Coatings for Aluminum Base Alloys

In addition to the conversion coatings already described for the aluminum base alloys, there are a considerable number of processes that have been suggested for the chemical oxidation of aluminum and aluminum alloys. While a few of these have been accepted for general production use, there are others that find less extensive use due either to their limited

production applicability, or their relative newness in the field of aluminum finishing. A number of these processes will be described to indicate the field of activity.

The great majority of the films obtained by chemical treatments serve as an excellent paint base due to their porous nature. Others are applied to aluminum for protective or decorative effect. Some of the oxide films formed may be colored with dyes, but the colors produced are not as satisfactory as those obtained on oxide films formed by electrolytic means. Although the surface structure of both chemical and anodized surfaces are similar, the chemical oxide coating usually is not as thick and, consequently, not as abrasion- and wear-resistant as an anodic coating. However, chemical treatments are applied with ease and at a minimum cost, with no special processing equipment required.

One of the more common solutions used in obtaining a chemical oxide coating is the *Alrok* process which specifies immersion of the work in a hot (150°F.) solution of 2.0% sodium carbonate and 0.10% potassium dichromate for a period of about 20 minutes. A subsequent sealing treatment in 5.0% potassium dichromate is used, which normally increases its protective power. The natural color of the oxide varies with the alloy, but usually is a yellowish-green after sealing.

The *M.B.V.* process is of considerable commercial importance in the foreign field for the production of a protective oxide film on aluminum alloys free of copper. The treatment involves immersion of the work in aqueous 5.0% sodium carbonate and 1.5% sodium chromate at 195 to 212°F. for 3 to 5 minutes, followed by rinsing. The surface film formed is a slate gray and has fair adhesion and abrasion resistance.

The *Jirotka* process, in which the oxide film is obtained by immersion in acid, alkaline, or neutral baths, produces an oxide matrix with embedded metallic particles. The film possess good adhesion and may be used as a base for subsequent electroplates or paints. The acid immersion bath consists of a dilute nitric acid solution containing about 0.50% of heavy metal salts, such as zinc, chromium, nickel, cobalt, or copper. The aluminum oxide film with embedded heavy metal particles is obtained by a 20 to 60 minute immersion. The alkali chromates may be used to increase the oxidation effect.

The alkaline bath uses an aqueous solution containing about 5.0% sodium or potassium carbonate and 1.0% of a heavy metal salt. The dark oxide film formed in this hot solution may be brightened by the addition of 5.0% potassium dichromate or glycerine to give the coating a metallic luster.

Another bath composition contains 5.0% permanganate, 5.0% sodium chromate, 0.50% of a heavy metal salt and 2.0% of either hydrofluoric, sulfuric, or acetic acid. The oxide film formed, usually after an immersion period of 10 to 15 minutes in a cold solution, is composed of manganese dioxide, chromic oxide, and aluminum oxide. The color of the film will depend upon the ratio of the abovementioned compounds within the film as well as the type of heavy metal employed. Instead of the acid addition in the above formula, 1.2% hydrogen peroxide and a 2.0% sodium dichromate addition may be used.

The *Protal* process consists of a solution containing 0.50% of an alkali manganate, molybdate, or vanadate, along with 1.0% sodium hydroxide or sodium carbonate. The subsequent immersion of the work-pieces in this boiling solution will produce metallic compounds which form two oxides, a higher one which is soluble in alkali and a lower, insoluble one. This occurs under the reducing action of hydrogen liberated at the aluminum surface. The lower oxide is deposited in the aluminum oxide film, forming an adherent protective coating on the metal.

Another bath type used in obtaining an oxide coating is that referred to as the *Pacz* process, the treatment consisting of an immersion in a hot (160 to 212°F.) solution containing 0.15% sodium fluosilicate, sodium oxalate, or sodium fluozirconate, along with 0.25% nickel or cobalt salts and 0.30% of sodium or ammonium nitrate. There may be a variation of color tone in the resultant film, due to the weak etching action of the sodium fluosilicate, etc., which dissolves aluminum. In the event that the aluminum alloy treated contains iron or silicon, darker areas may result since these constituents remain relatively unattacked.

In the *McCulloch* process, upon immersion in a hot (160 to 212°F.) solution of 1.0% calcium hydroxide and 1.0% calcium sulphate for about one hour, a white film forms on aluminum and a greenish-white film on aluminum base alloys. Evolution of hydrogen will occur during immersion and, as soon as this subsides, the work-pieces are washed and heated to about 390°F. The film is composed of both calcium and aluminum sulphate and aluminum oxide. In addition to its protective qualities as a paint base, the coating exhibits increased electrical resistance. If the aluminum is treated in a hot bath containing 0.50% barium oxide and 0.50% barium sulfate, a uniform, silvery-gray, adherent film is formed on the metal surfaces.

A black color on aluminum may be produced by:—(a) immersion in a solution of sodium chloride with aluminum alloys containing silicon or iron turning to a dark color, and (b) immersion in a bath of arsenious oxide, ferrous sulphate, and hydrochloric acid, in which the precipitated arsenic forms a deep black color. Aluminum parts thus treated are usually for interior use.

These chemical oxide coatings are comparatively thin and, on the basis of coating weight, they are of the order of 3.5 to 8.0 mg./in.^{2} This variation is due to the process employed, processing variables, and the alloy. The dimensional change is about 0.10 mil on both wrought and cast alloys, which need not be considered unless very close tolerance on the work-pieces are required.

Coatings for Titanium Alloys

Thus far, conversion coatings on titanium and titanium alloys are for the purpose of facilitating cold working and to prevent galling under a frictional load. Fabian[5] has indicated that a coating, which consists of a potassium-titanium-fluoride complex, is produced by a 2 to 10 minute immersion in a fluoride-phosphate bath operated in the range of 80 to 185°F. When this coating is exposed to an air oxidation treatment for a

(*Continued on page* 70)

Continuous and Batch Treatment of Industrial Wastes

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This is the second and final installment of the article on industrial wastes. The first part appeared in the March issue. —*Ed.*

Batch Treatment

THE various dumpings of spent solutions from the mechanical finishing and painting departments, as well as the oily wastes originating from the quenching operations, flow by gravity to two 7,500-gallon neutralization tanks made of steel, lined internally with plasticized polyvinyl chloride plastic sheeting, with means provided for the feeding of coagulating agents, acids, or alkalies, as required. The batch treatment system is shown diagrammatically in Figure 5. Auto-skimmed oil is pumped to an intermediate storage tank, where entrained water is removed and returned by pumping to the tanks, and is then pumped to a final storage tank, wherefrom it is carted away by an outside firm.

The oil-free wastes are pumped either directly to the pressure filters or after passing through the continuous neutralization tank.

Laboratory facilities are available in the plant for routine and complete analyses. The instrument panel is an integral part of one of the walls of the laboratory and is referred to constantly as an indication of the operation of the plant.

The treatment facilities employ six persons, two operators on afternoon shift and four on day shift, consisting of one technician in charge of the operations, one analytical chemist, one chemist-operator, and one repairman.

CYANIDE TREATMENT:

Three tanks in series are provided for treatment, each tank having a nominal detention time of approximately 100 minutes for average flow conditions. These conditions can be maintained most of the time because of the fact that the flow is kept constant by pumping from the equalization or surge tanks. Cyanide is oxidized to cyanate in the first tank at a pH value of 9.5 to 10.0 and an oxidation-reduction potential of 350 to 400 millivolts. The second stage of the oxidation, that of cyanate to carbon dioxide and nitrogen, and nitrate by-products is effected in the second tank at a pH value of 8 and an oxidation-reduction potential of approximately 600. The same control conditions exist in the third tank as in the second tank. Actually, the purpose of the third tank is for standby protection. Normally, it is not used.

pH control is quite satisfactory, and O-R-P control is affected only by the presence of nickel when nickel strip waste is dumped. Nickel ion causes the depression of the O-R-P measurement. That results in a false demand for additional oxidizing agent and in the feeding of relatively large excess quantities of chlorine which oxidize trivalent chromium back to the hexavalent state in the neutralization tank where all rinses are mixed.

CHROMATE TREATMENT:

The treatment of chromate rinses takes place in two tanks located in series. Each tank is designed to provide a nominal detention time of 45 minutes for average flow conditions. Chromate is reduced in the first tank at pH values varying from 1.8 to 2 and oxidation-reduction potential values of 250 to 300 millivolts. The second treatment tank is used for standby protection and it has the pH and O-R-P controls set at the same values as in the first tank. This tank is needed at high chrome concentrations.

NEUTRALIZATION:

As mentioned previously, final neutralization of all waste streams is normally effected at a pH value of 8. The neutralization tank has been designed for a nominal detention time of 45 minutes, at average flow rates.

It is in this tank that all the metals are converted to the hydroxide, precipitated and later removed by filtration.

Solids Removal System

This is different from the conventional system used for the clarification of slurries, which involves either a clarifier or a solids contact unit followed by a dewatering operation. In the system used by the Lexington plant, the clarification of the slurry and the dewatering of the sludge are done in one step by means of pressure filters.

The initial operation consists in applying a precoat of diatomaceous earth on the wire cloth surrounding the filter leaves. The thickness of the precoat is on the average $\frac{1}{16}$ inch thick and contains on the average 2 ounces of diatomaceous earth per square foot of coated area. After the application of the precoat, slurry is pumped at a rate of flow of 250 gpm to each filtration unit; approximately 30 per cent is filtered and the rest is recirculated back to the filter sump. The percentage filtered does not necessarily

correspond to the full capacity of the filter, since the flow is regulated by flow regulators on the filter effluent discharge, and since the filtration rate is also dependent on the extent of pretreatment given to the slurry. Recirculation is necessary to obtain sufficient velocity in the filter shell to prevent stratification of solids towards the bottom of the filter members.

For pretreatment, 750 grams of an acrylamide type high molecular weight synthetic polymer which is used as a coagulant aid, are fed regularly, during every 9-hour period, to the slurry which is being filtered at the rate of approximately 140 to 150 gallons per minute. It has been found to enhance filtration. Sometimes a 50-pound quantity of diatomite type filter aid, is fed gradually during a filter run, whenever paint pigments are present in the slurry, because of their tendency to blind the filter leaves.

A filtration run will normally last approximately 16 hours. The operation of the two filters is so spaced that one unit is placed in operation at approximately the same time as the other unit is removed from operation. Thus, while one filter is being cleaned the other can be operated at greater than normal capacity, because it has been freshly precoated.

The average amount of solids filtered out daily has been approximately 1,000 pounds, corresponding to approximately 40 to 50 cu. ft. per day of filter cake. The filter cake is collected in carts which are rolled under the filter shells and then transported by truck to the City Dump.

The operation of the two batch treatment tanks has presented a few problems because of the variable nature of the wastes. During the design stage, it was expected that the paint and oil-rich wastes would adversely affect the operation of the continuous treatment plant and, for that reason, it had been decided to provide batch treatment facilities. Inasmuch as the contents of the tanks are treated on a fill-and-draw basis, even the most vexing problems can be resolved without shutdowns of manufacturing operations.

Although provisions were made for the addition of acids, alkalies and coagulating agents to the batch treated wastes, prior to filtration, thus far it has not been necessary to resort to chemical treatment.

Substantially all instrument controls are operating satisfactorily. The six pH and five O-R-P electrode assemblies, which are of the submersion type, have been in practically continuous use for approximately eighteen months, with very few electrode replacements.

The electrodes are cleaned two to three times a week with 10 per cent by volume hydrochloric acid solution, in order to dissolve a white deposit which appears to be calcium carbonate and which would eventually interfere with the operation of the electrodes. The reading of the electrodes is checked every two hours against the reading of a portable pH meter. A standard buffer solution is used to calibrate the electrodes only after they have been cleaned. The O-R-P electrodes do not have to be calibrated, but they have to be checked occasionally with standard quinhydrone solution at pH 4 merely to determine whether or not they are defective.

Of interest to the reader is the fact that, in the past, the electrodes had to be cleaned more frequently because they were made inoperable by an oil coating.

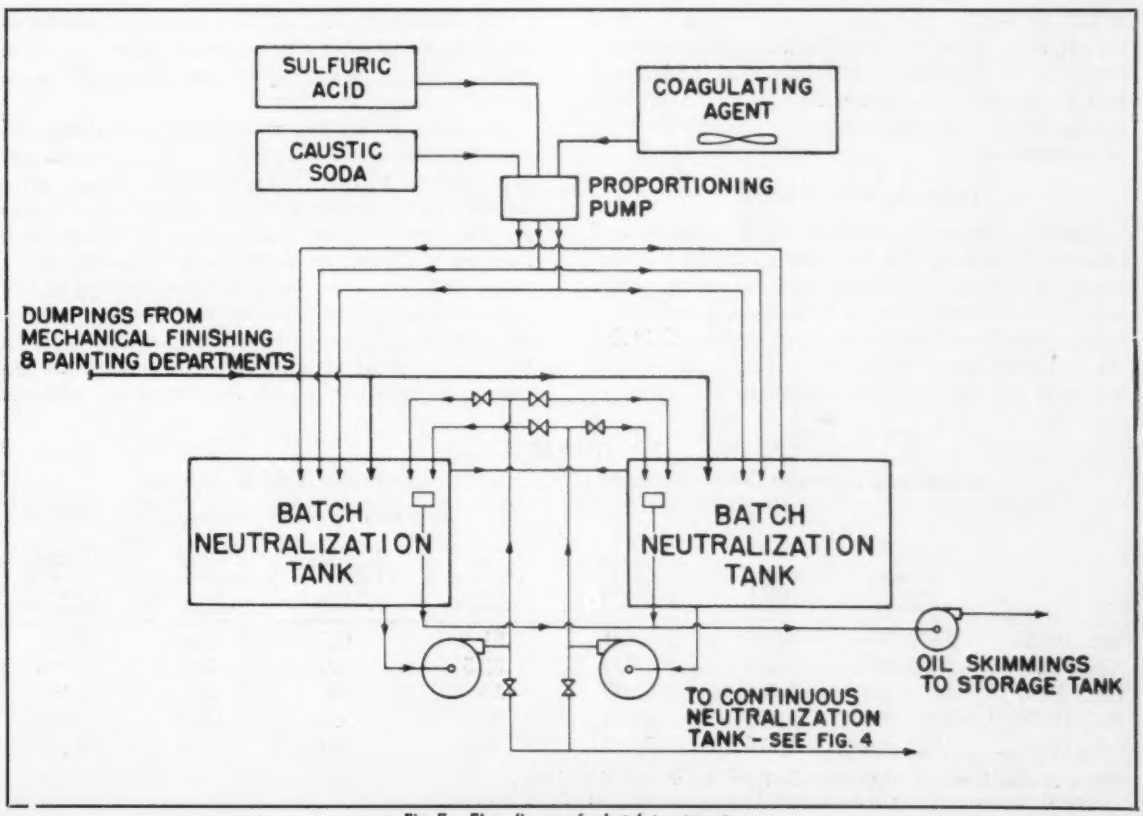


Fig. 5. Flow diagram for batch treatment.

TABLE I

Consumption of Chemical Reagents and Other Compounds Between October, 1958 and March, 1959 (Pounds)

	October 1958	November 1958	December 1958	January 1959	February 1959
Chlorine	8,000	4,260	7,545	8,140	8,480
Sulfur Dioxide	5,000	4,480	6,295	5,710	7,635
Caustic Soda (50%)	14,500	8,400	12,020	Approx. 15,000	Approx. 15,000
Lime Slurry (40% solids)	60,000	60,000	15,000	75,000	60,000
Sulfuric Acid (66° Bé)	10,000	11,770	10,000	10,440	5,000
Sodium Metabisulfite	300	540	300	1,760	1,680
Sodium Hydrosulfite	50	950	250	250	300
Calcium Hypochlorite	0	0	100	0	200
Diatomaceous Earth	4,500	6,000	6,000	6,000	4,500
Asbestos-Cotton-Paper Pulp Mixture	200	250	200	300	350
Asbestos-Diatomaceous Earth Mixture	1,500	1,900	2,100	1,900	2,100
Coagulant Aid	0	50	50	50	50
Volume Treated (gallons)	2,570,580	2,125,620	2,237,680	3,367,680	3,227,000
Operating days	27	24	25	25	23

NOTE 1—All reagents are in commercial strength.
NOTE 2—Solids in lime slurry contain approx. 95% Calcium Hydroxide.

The difficulty was resolved by immersing the electrode assemblies deeper.

The metal frame and hood portion of the electrode assemblies immersed in the chromate wastes under treatment became pitted shortly after the plant was placed in operation. It was found that the parts, which are made of stainless steel Type 316, were attacked by hydrochloric acid which was present in the spent acids fed to the chromate treatment tanks. It will be recalled that spent acids are used to lower the pH value of the chromate wastes to approximately 2 and that fresh sulfuric acid is only used if additional acid is required. The bothersome corrosion problem was resolved by the application of a protective coating of polyethylene.

Discussion of Results

Monthly consumptions of chemical reagents and other compounds used in the waste treatment plant are shown in Table I. From those data, the average quantities and concentrations of total cyanide and hexavalent chromium treated have been calculated (Table II) assuming that 7.35 parts by weight of chlorine are used for the complete oxidation of 1 part of cyanide (as CN), and that 0.96 part by weight of sulfur dioxide is used to reduce 1 part of chromic acid (as $CrCO_3$). It is noted that the concentration of CN in the cyanide wastes varies from 465 to 830 ppm, and that of chromic acid in the chromate wastes, 1500 to 2200 ppm, compared to 600 ppm and 1820 ppm, respectively, as calculated on the basis of expected dragout and 80 per cent load on the plating lines.

The average quality of the treated and filtered effluent, in February, 1959, compared to the quality of water used in plating operations during the same period, is shown in Table III.

The daily concentrations of chlorides, sulfates and total hardness have been plotted vs. days for February and part of March (See Figure 6). Beside being indicative of the quality of the treated effluent, they are indicative of the daily loads of contaminants reaching the waste treatment plant. Inasmuch as the results of analyses are based on the composites of only two samples, one collected in the morning and the other in the afternoon, they should not be used for the calculation of material balances because the frequency of collection of the samples is not sufficient

TABLE II

Calculated Average Concentrations of Cyanide and Chromic Acid in Influent

	Total Volume Treated (Gallons)	Cyanide (CN) Lb.	Chromic Acid (CrO_3) Lb.	Cyanide (CN) ppm (Based on total Volume of Waste Filtered)	Cyanide (CN) ppm (Based on Individual Volume of Waste Filtered)*	Chromic Acid (CrO_3) ppm (Based on Total Volume of Waste Filtered)	Chromic Acid (CrO_3) ppm (Based on Individual Volume of Waste Filtered)**
Oct., 1958	2,570,580	1,085	5,450	51	725	256	1,500
Nov., 1958	2,125,620	580	5,700	32.5	465	319	1,870
Dec., 1958	2,237,680	1,040	6,800	56	805	367	2,150
Jan., 1959	3,367,680	1,110	8,650	39.5	565	307	1,800
Feb., 1959	3,227,000	1,175	9,200	43.8	630	375	2,200

*Flow of cyanide wastes calculated to be 7 per cent of total filtered flow.
**Flow of chromate waste calculated to be 17.1 per cent of total filtered flow.

TABLE III

Average Quality of Treated Effluent and of Water Used in Plating Operations During February, 1959

	Treated Effluent	*Fresh Water*
pH	8.4	7.4
Total Solids (ppm)	3350	—
Calcium Hardness (ppm $CaCO_3$)	1380	89
Total Hardness (ppm $CaCO_3$)	1425	115
Phenolphthalein Alkalinity (ppm $CaCO_3$)	41	0
Methyl Orange Alkalinity (ppm $CaCO_3$)	1170	40
Chlorides (ppm Cl)	830	13
Sulfates (ppm SO_4)	1240	52
Total Cyanide (CN)	0	—
Hexavalent Chromium (Cr)	0	—

to guarantee that the composition of the composite sample is representative of the average composition of the treated effluent.

Routine determinations of hexavalent chromium and cyanide, for control purposes, are made quite frequently. Cyanates are determined infrequently, and they are either absent or are present in relatively small quantities. The methods of analyses employed are in accordance with Standard Methods for the Examination of Water, Sewage and Industrial Wastes, Tenth Edition, published by the American Public Health Association. For routine determinations of cyanides in the effluent, a modification of the pyridine-pyrazolone colorimetric method is used directly on the sample, without distillation, and is found to require less than 2 minutes for each analysis.

The average concentration of suspended solids in the influent to the filters has been calculated to be 890 ppm and the average filtration rate 5.7 gallons per hour per square foot.

Prior to the determination of the filtering area required, extensive preliminary small pilot plant tests had been made. They involved the filtration of a synthetic slurry containing 600 ppm of suspended solids through a filter leaf having a net filtering area of 0.5 sq. ft. The results obtained indicated that a rate of filtration of 6.7 gph/sq.ft. could be expected with dolomitic lime as a neutralizing agent and that lower rates should be expected with high calcium lime. The addition of ½ to 1 ppm of coagulant aid was found to be beneficial.

The aforementioned results had also been corroborated by experiments made with a commercial size filter on neutralized slurry at the IBM Kingston plant. It is interesting, therefore, to note that the results obtained in a relatively small pilot plant filter were in substantial agreement with the results obtained later with commercial size filters.

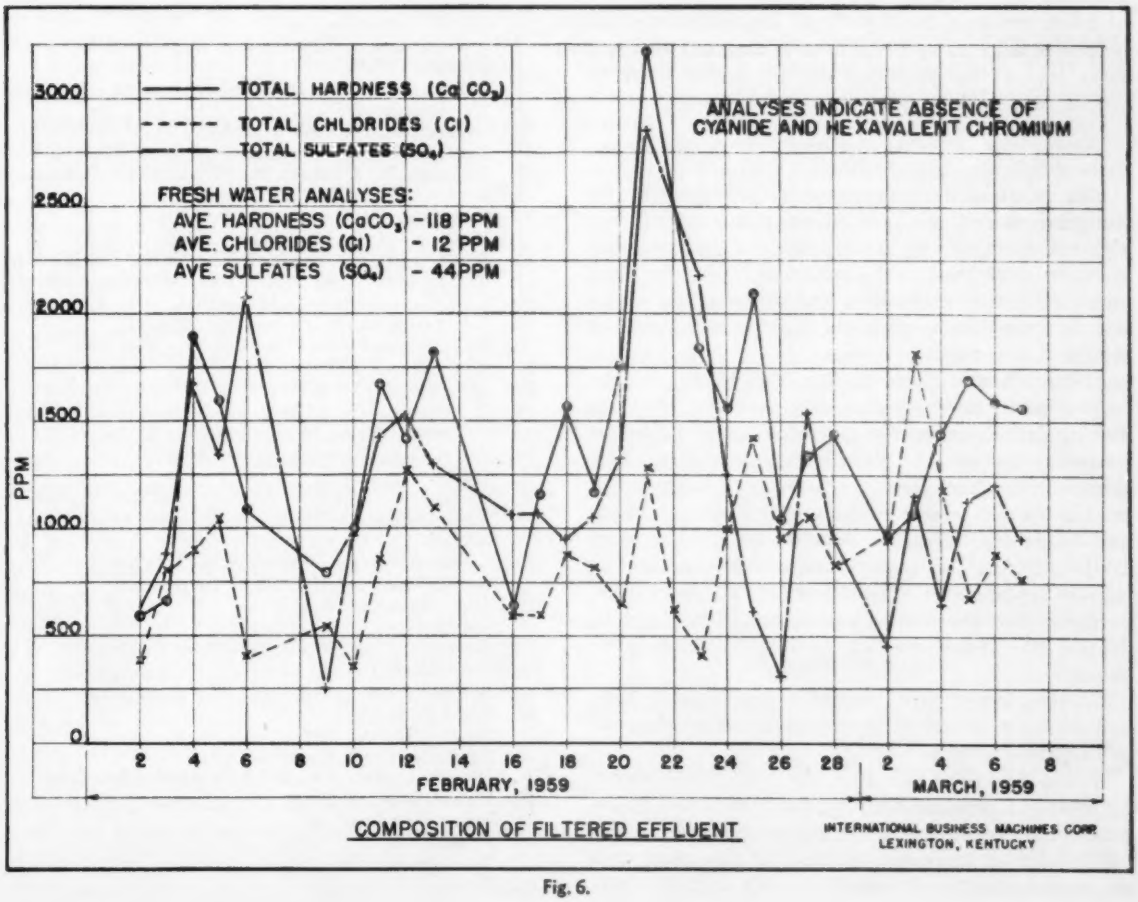


Fig. 6.

From the data obtained at Lexington, it has been calculated that an average of 0.308 pound of filter aid is used per pound of filter solids. Greater relative quantities of filter aid had been used in the preliminary investigations; however, very little work had been done to determine minmum filter aid requirements. The quantity of coagulant aid used corresponds to an average of 4.44 pounds per ton of suspended solids, or approximately 2 ppm, based on the flow of neutralized slurry filtered, compared to 1 ppm used in the preliminary investigations. In the preliminary studies, it was also indicated that 13.5 hour filtration cycles were to be expected. That prediction compares quite favorably with the 14-hour filter runs at the plant, before it is necessary to remove the filter cake and condition the filter for another filtration cycle.

A plot of solids filtered out vs. concentration of suspended solids in the influent to the filter showed that the relationship is approximately of a straight line type up to a suspended solids concentration of 1000 ppm in the influent. Beyond that concentration, the slope of the curve begins to decrease. The average percentage of solids in the filter cake, in February, was approximatly 25 and varied between 17.7 and 42.4. Since there is very little quantitative information on the subject, it is not possible to determine what operating conditions should be maintained to obtain a filter cake of more uniform density from day to day. From the point of view of handling, it would be desirable to obtain a filter cake with a percentage of solids greater than 20 per cent. Possibly that could be achieved by a regulation of coagulant aid feed and body feed or by extending the air drying prior to discharge of the filter cake.

Conclusions

The industrial waste treatment facilities described in the previous sections have operated satisfactorily for eighteen months. The results obtained indicate that an instrument controlled continuous treatment plant successfully remove cyanides and chromates by chemical treatment from relatively concentrated rinses at regulated flow rates.

The result also show that cyanide wastes can be successfully treated continuously with the chlorine feeding facilities properly controlled by oxidation reduction potential (O-R-P) electrode assembles. This statement, for the present, applies to solutions containing alkali cyanides, cadmium and zinc cyanides, and quantities of copper cyanide not greater than 10 to 12 ppm, or slightly below the solubility of cuprous cyanide in distilled water at room temperature. The presence of nickel has been found to depress the O-R-P reading causing overfeeding of chlorine.

Cyanides are oxidized completely to carbon dioxide and nitrogen in a two-step reaction taking place in two separate tanks in series.

A one-step clarification of the neutralized slurry by means of pressure filtration has been found to be feasible. A comparison of operating costs between the solids removal technique practiced at this plant and the more conventional method of using separate clarification and dewatering units cannot be made at this time, for lack of comparable data in the published literature.

Acknowledgment

The authors wish to acknowledge the services of *Leonard Henry*, technician in charge of the industrial waste treatment facilities, *Paul L. Shklar, G. Irvine, A. Friefeld*, who gave considerable assistance throughout the design phase of this project, and to *J. C. Hesler*, of National Aluminate Corp., who participated in the chemical and engineering studies.

CONVERSION COATINGS

(*Continued from page* 65)

period of 2 to 5 hours at 800°F., a definite improvement in wear resistance is realized. In a reciprocating wear test against steel surfaces at 2500 psi, coated and lubricated surfaces were found to operate for an almost unlimited time before galling occurred. Untreated specimens failed shortly after test started.

References

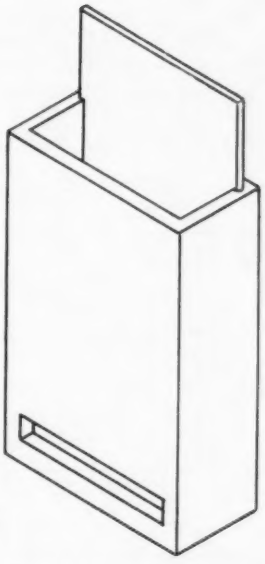
1. Precision Metal Molding, p. 54 (Dec. 1957).
2. Heitzelmann, E. Jr., Organic Finishing, (May 1957).
3. Pocock, W. E., Metal Finishing, (Dec. 1954 and Jan. 1955).
4. Finishing Publications Inc., "Metal Finishing Guidebook," 1958 ed., Westwood, N. J.
5. Fabian, R. J., Materials in Design Engineering, p. 121, Aug. 1957.
6. Anderson, E. A., Proc. A.E.S., 6, (1943).
7. Reynolds Metals Company, "Finishes for Aluminum," 1951 ed., Louisville, Ky.
8. Graham, A. K., "Electroplating Engineering Handbook," Reinhold Pub. Co., 1955.
9. Ogburn, F., Salmon, H. I. and Kronenberg, Plating, **42**, 271. (March 1955).
10. Stricklen, R., Materials & Methods, **35**, 91 (Feb. 1952).
11. The Dow Chemical Co., Magnesium Dept., Midland, Mich.
12. Cavanagh, W. & Gibson, B., Plating, (June 1955).
13. Bary, J., Metaux, No. 350, p. 399 (1954).
14. F. R. Granville—Richards, USP 1069903.
15. M. Green—H. H. Willard, USP 1660661.
16. T. W. Coslett, Brit. Pat. 8667, USP 1007069 and 1610362.
17. R. R. Tanner—V. M. Darsay, USP 1887967, 1888189.
18. R. R. Tanner—H. J. Loddeesen, USP 1911726.
19. J. S. Thompson—M. Darsay, USP 2293716.
20. M. A. Streicher, Metal Finishing, 61, (Aug. 1948).
21. R. R. Tanner, USP 2373433.
22. G. C. Romig, USP 2164042.
23. G. Jernstedt, USP 2310239 and 2322349.
24. G. Jernstedt, Trans. Electrochem. Soc., **83**, 361 (1943).
25. Henly, V. F., Electroplating and Metal Finishing, **3**, 248, (1950).
26. Cutter, P. R., 33rd Proc. Electroplaters' Soc., 257, (1946).
27. Young, Metals Handbook, 730-732, Amer. Soc. for Metals, 1948 ed.
28. Copper and Brass Research Assn., "Maintenance, Cleaning, Finishing and Coloring of Copper.
29. Allied Research Products Co.
30. Aluminum Co. of America.
31. American Chemical Paint Co.
32. Ethone Inc.
33. Heatbath Corp.
34. Kelite Corp.
35. Metal & Thermit Corp.
36. Mitchell-Bradford Chemical Co.
37. Mutual Chemical Div., Allied Chemical & Dye Corp.
38. Nielson Chemical Co.
39. Parker Rust Proof Co.
40. Pennsalt Chemical Corp.
41. Turco Products Inc.
42. Brooks & Perkins, Inc.

FINISHING POINTERS

VERTICAL SLOT CELL

By J. B. Mohler
Consultant, Seattle, Wash.

NUMEROUS plating range cells are in use and others have been proposed. All of these have one thing in common, namely, that they produce a non-uniform current over the cathode and, thus, a range of current densities. One second requirement is essential; that the positions of the electrodes with respect to the walls of the container be fixed. The fixed and defined arrangement constitutes a standard plating test cell. The cell may then be used to determine overall plating quality of a bath by plating a panel and comparing it with a panel plated from a bath operating at optimum quality.



Design and construction of a plating range cell is a relatively easy matter. Cells can be made of many non-conducting materials, although Lucite or Plexiglas are most common. These plastics are easily cut and machined. Good square pieces can be joined by soaking the edges in methylene chloride until tacky and then holding or clamping in place until a bond is formed (about one hour). After about 24 hours the constructed cell is essentially as strong as a solid piece of plastic. Precaution should be taken that all bonding surfaces are square and flat (or can be forced under pressure).

Since construction is simple, it is practical to use a new design, particularly if this design satisfies a special need. It is recommended that the cells be calibrated, but practical calibration for control purposes consists merely of direct comparison of a series of panels.

The "slot cell" has the unique advantage that the anode may be placed anywhere outside the cells and it will not influence the cathode. The anode only serves as a source of current, the slot itself influencing the current distribution by restriction of the source with respect to the cathode.

There are special advantages to the use of a vertical slot cell as shown in the sketch. The cell is a very convenient form of dip cell and can be hung directly in the bath. Side to side uniformity of the deposit is good, since the flow of solution, due to convection, is in the non-uniform rather than the uniform direction. The cathode length can easily be changed by immersion to any desired depth.

The cell lends itself to good flow reproducibility when it is desired to study the influence of flow on the plating range. Solution is pumped into the top of the cell and allowed to flow out of the slot. If the rate of flow is known, then the linear flow can be calculated since the shape of the box favors uniform flow past the cathode.

SCIENCE FOR COATINGS TECHNOLOGIST

(*Continued from page* 59)

The wet press-cake is simply mixed with the proper vehicle and a suitable wetting agent. As the mixing proceeds, the organic vehicle replaces the water on and around the pigment particles. This water rises to the top and is spilled off.

The resulting flushed dispersion is remarkably fine and smooth with maximum color strength. Since the operation of drying and grinding has been eliminated, the cost of flushed colors is quite reasonable. Many manufacturers of flushed colors give their product a pass over a three-roll mill to break up any aggregates. This gives an even better, but more expensive product.

Only those colors which are prepared by precipitation from water solutions can be made in flushed form. This includes chrome yellows and chrome oranges and most organic colors such as phthalo blues and greens, toluidine red, etc. Blacks and earth colors are not included in this category.

Because of their reasonable cost; good properties, especially gloss and tinting strength; and convenience, the use of flushed colors is increasing steadily in the paint industry. In general, they are not used for making the basic pigmented goods, but rather for tinting of basic materials. They are also useful for making up small batches without the need for grinding. It is very uneconomic to clean up a mixer and a mill for a small batch of colored enamel. This convenience is perhaps the biggest advantage of flushed colors.

Literature Cited

1. Daniel. "Influence of Solvents on Pigment Dispersion and Seeding." Official Digest, October 1956.
2. Pearce. "Principles of Grinding." Official Digest. June 1957.
3. Candee. "Modern Approach to Dispersions." Kinetic Dispersion Corp., no date.
4. Hoback. "Practical Aspects of Pigment Dispersion." Calco Technical Bulletin #903, no date.
5. Doubleday and Barkman. "Reading of the Hegman Gauge." August 1950.

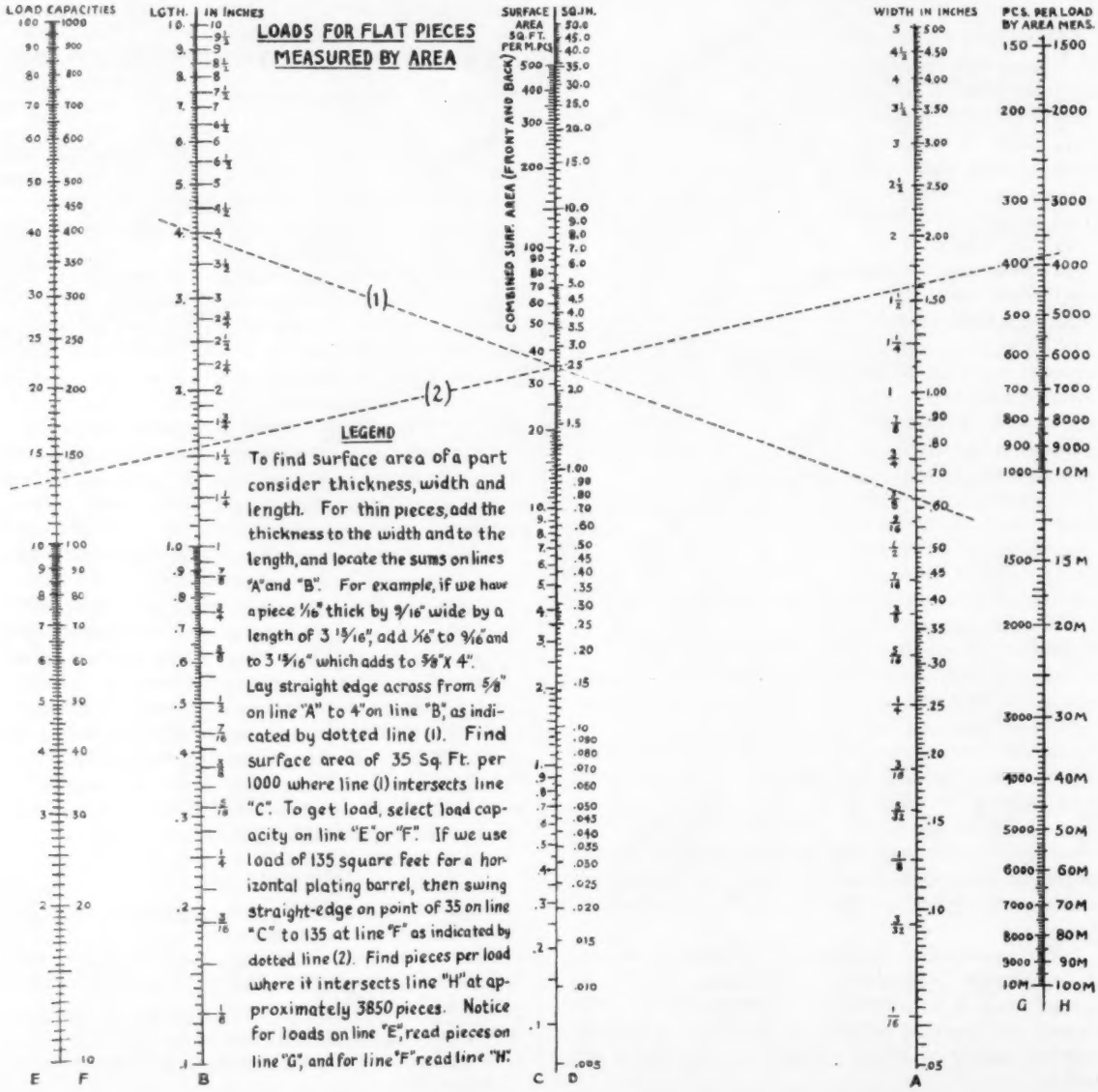
Measuring Loads for Flat Pieces by Area

By George Clayton Field, *Cutler-Hammer, Inc., Milwaukee, Wis.*

THERE are many ways of measuring loads for plating: by weight, by volume, and by area. Were it not for mechanical limitations, the surface area would be the most accurate and scientific method. There are many occasions when it is absolutely necessary to use surface area for determining loads. At Cutler-Hammer, Inc., it has been found necessary to use both surface area and weight for establishing loads for automatic plating. The area measures the number of pieces per load in order to obtain the proper thickness of plating. and the weight of that number of pieces is furnished to the workmen so that they may load the barrels consistently with the prescribed number of pieces.

Using the Chart

When using this chart, the first thing to consider after reading the legend shown on it, is the kind of plating load which is to be estimated. If horizontal barrels are



going to be used, and the pieces to be estimated are similar to those described in that legend, then area may be the means of measure and the chart would be used as outlined. If the pieces are much more than ⅛ thick, then weight would become a limiting factor, and one could use the chart published in the March 1958 issue and the September 1959 issue of METAL FINISHING, the respective titles of which are, "Measuring Loads of Solid Steel Parts," and "Weights and Loads of Parts Made of Various Metal Bars." There are occasions when both the weight charts and the area charts may be used to determine loads, such as some types of automatic plating mentioned previously. If it should be necessary to estimate by area pieces that are thicker, then disregard the instructions given in Legend No. 1 and observe the rules and examples given in Legend No. 2.

Inasmuch as the chart used in this way would probably be used for automatic plating, a helpful word in this direction perhaps would be appreciated. The automatic plating described here is that in which many oblique barrels use the same plating solution. For this type of automatic plating, there are several important factors to consider. It is almost necessary to establish a table of loads for one's own use, and which will provide for all of the contributing elements. The table in Fig. 3 is not official at Cutler-Hammer, Inc., but it may be used as a logical form, a pattern for making one's own for specific use.

The loads in the total number of barrels in the line

LEGEND NO. 2

Where more accuracy is required for parts that are thicker, the end area should be calculated separately. The reason for this may be seen in Fig. #1 below. See the corner, "A", which is not supposed to be included.

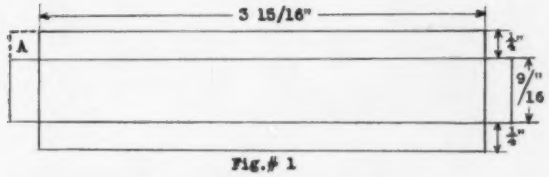


Fig.# 1

For these thicker pieces proceed as follows:

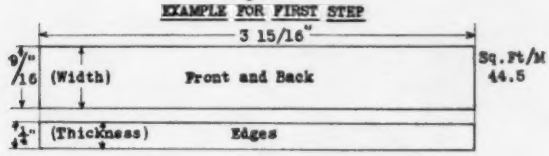
1st Step—Add the inches thick to the inches wide. Select the combined figure, (thickness + width) as width on line "A". Read the answer on line "C", and record on your paper.

2nd Step—For end area, select the width as the length on line "A" of the chart, and the width as length, on line "B", of the chart. Read the answer on line "C", and record on your paper, below answer for step one. The sum will be the surface area total for 1000 pieces.

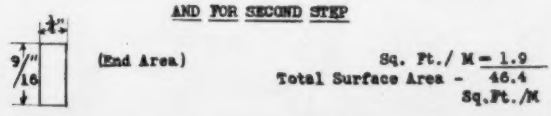
3rd Step—Find pieces per load where straight edge intersects line for load capacity on "E" or "F".

Fig.# 2

EXAMPLE FOR FIRST STEP



AND FOR SECOND STEP



Selecting Guide For Type Of Barrel And Load Size.		Type of Barrel "A" 1/8"Dia. Holes	"B" 1/4"Dia. Holes	"C" 3/8"Dia. Holes
Type of Work	Plating Time	20 Min.	20 Min.	20 Min.
	Amps.Per Bbl.	200	250	350
	Plating Thickness	Area of Work Square Feet per Barrel		
Flat Work (Washers-Plates)	.00025			
	.00035" .00045"		12	14
	.0005"		5	7.5
Parts That Fit Closely Together. (Small Parts)	.00025"	15	25	40
	.00035" .00045"		10	12
	.0005"		8	10
Parts That Do Not Fit Closely Together. (Large Parts)	.00025"	15	20	25
	.00035" .00045"	10	15	20
	.0005"	7.5	12	15
Maximum Weight - 50 #				

Figure # 3

of this type of automatic plating machine present a specific total surface area to the plating solution with its one current density. The aim is to regulate the size of the loads by surface area in each barrel, so that the overall load remains constant. If we have flat pieces in one or two barrels in the line, rivets in the next few barrels, and studs in the next few, it stands to reason that, if the area is to remain constant and we are to get a specific thickness of plating on all of the various loads, then we will have to vary the number of pieces, which are most conveniently counted by weight.

In the table in Fig. 3 it will be noticed that there are three different types of barrels, classified by size of the wall perforations, such as ⅛", ¼" and ⅜" diameter. This also becomes a factor in load measuring, because those with larger holes permit more solution to flow through the work than barrels with small holes. This, then, becomes a means of thickness regulation. The smaller the holes, the less metal will be deposited. Also, the larger the loads the less plating will go on. It can be seen, then, that area is quite indispensible. With these various elements it is difficult to make the proper selection without some confusion. This the reason for the table in Fig. 3. If the table is studied, there will be seen a thickness of 0.00025", which is intended for threaded parts. This limitation prevents studs and nuts from becoming too thick to fit. The purpose is to obtain a specified thickness of deposit on the pieces in each barrel by regulating the amount of surface area and the right barrel for each part being plated.

The mechanics of testing and current regulation cannot be covered in this article. Our main concern is to show the application of the chart for area as well as weight. Predetermined specifications, that are recorded and used on repeated orders, are a labor-saving method and provide the means to efficient plating, and it is hoped that these charts will make that job just a little easier.

SHOP PROBLEMS

BARREL FINISHING — POLISHING AND BUFFING
CLEANING — ANODIZING — ELECTROPLATING
RUSTPROOFING — LACQUERING AND ENAMELING

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Speculum Plating

Question: We are interested in selecting a speculum plated surface with the hardest surface possible. This speculum will be approximately 0.0002 to 0.0003 inch thick over a copper base.

Will you please send us data on plating formulas that we can use to obtain the hardest speculum surface.

T. R.

Answer: Speculum deposits, containing 45% tin and 55% copper, are quite hard, in the range of nickel, but the solutions require very close control.

A solution published by the Tin Research Institute consisted of the following:

Sodium stannate	100 g./l.
Copper cyanide	11.5 "
Sodium cyanide	28.5 "
Sodium hydroxide	10.0 "
Temperature	150 deg. F.
Current density	15-25 amp./ft.^{2}

About 1 ml./l. ammonia is added to a new solution, and the process is operated with separate copper and tin anodes, the latter requiring filming as in tin plating from the stannate bath.

Complete instructions for operation and control will be found in a booklet available from the Institute at 492 W. 6th Ave., Columbus 1, Ohio.

Cyanide in Zinc Baths

Question: Our zinc plating solution is made up with the following formula:

5.6 oz./gal.	sodium cyanide
8.0 "	zinc cyanide
10.0 "	caustic soda

The total cyanide will be 12.3 oz./gal.

My question is: To keep the total cyanide at 12.3 oz./gal. is it necessary or advisable to use zinc cyanide from time to time, as you would use sodium cyanide?

C. F. J.

Answer: Zinc cyanide is added to the zinc solution only when the metal content is low. For each ounce per gallon of zinc cyanide added, the total sodium cyanide analysis of the solution will increase by 0.8 oz./gal.

If the metal content is satisfactory, the total cyanide should be raised with sodium cyanide only.

Plating on Tungsten

Question: We have a problem of plating on Fansteel 77, which is stated to be an alloy consisting of 89% tungsten, 7% nickel, and 4% copper, produced by compacting and sintering the metal powders. Can you suggest any plating procedures for this material?

A. P. G.

Answer: A recent patent by Huddle & Flint, assigned to the United States of America (U. S. Pat. #2,835,630) suggested the following procedure for plating on tungsten:

The metal is shot blasted with a ferrous metal shot, then an immersion copper is applied, followed by electroplating. The copper solution consists of:

Copper sulfate	200 g./l.
Sulfuric acid	48 "
Aluminum sulfate	24 "
Wetting agent	0.1%

Another method, suggested by S. S. Brenner (U. S. Pat. #2,805,192), involves application of a flash brass plate from a standard plating solution. The plated part is then heated at 750-900°C. for 10 minutes in a non-oxidizing atmosphere. This results in volatilization of the zinc from the deposit, leaving a non-continuous film of diffused copper, which permits a good bond to a subsequent nickel deposit.

Descaling Kovar

Question: We are looking for a formula for descaling Kovar metal. If you know of one, please forward to us.

W. R.

Answer: A patent was granted recently to Certa (U. S. Pat. #2,878,189. March 17, 1959, assigned to Philco Corp.) on a hot pickling solution for alloys of nickel, cobalt and iron. The solution consists of 15-30% by volume sulfuric acid plus 10 oz./gal. ammonium sulfate.

For light scale, various mixtures of nitric, hydrochloric and acetic acids are usually used. Proprietary mixtures are also available, some containing inhibitors to minimize attack on the basis metal.

Black Anodizing Aluminum Die-Castings

Question: What procedure do you recommend in order to obtain a jet black anodized and dyed (sulfuric acid) finish on aluminum alloy die castings of the following composition:

Alcoa Alloy # 380 — Copper 3.0/4.0 — Silicon 7.5/9.5.

Balance aluminum with maximum iron of 1.3%.

Please advise proper cleaning and etching procedure and specific operating conditions of the anodizing bath along with any special dyeing and sealing instructions.

B. M.

Answer: Because of the silicon content of aluminum die-castings, there is a tendency to produce a grayish color rather than a jet black when anodizing and dyeing. The following procedure has been suggested to minimize the condition:

1. Degrease and clean in inhibited alkaline cleaner (an etching cleaner will produce a silicon smut on the surface).
2. Nitric dip.
3. Anodize in 16% by weight solution of sulfuric acid at 70-72°F., for 50 minutes at 21-24 volts.
4. Dye in a 3B Aluminum Black dye solution at pH 5.8-6.2, temp. 150°F., for 10-30 minutes, as required.
5. Rinse in hot water and seal for

10 minutes in a nickel acetate sealer.

6. Cold and hot rinse, then dry.

The smudge left after the dyeing operation may be removed by buffing or abrasive pellet blasting.

Contaminated Nickel Bath

Question: We recently transferred a high-sulfate nickel bath (for die castings) from a wood tank to a lead-lined tank. This lead-lined tank had previously been used for a black nickel solution and, although it was washed well, some zinc contamination may have remained.

Now, we are getting varying black deposits at high and low current density areas and over a wide amperage range. The solution was maintained according to the formula in the METAL FINISHING GUIDEBOOK, although at present we have increased the sodium sulfate and lowered the pH. Could the lead lining have any effect?

If zinc is present can it be precipitated out rather than dummy plating?

T. J. P.

Answer: Unless the pH is exceptionally low, or the chloride content very high, a lead-lined tank should be suitable for this type of solution.

The black deposits are probably due to zinc contamination, and low current density electrolysis at about pH 4.0-4.5 would be the only practical method of removal. Addition of sodium carbonate has been suggested to precipitate the zinc as zinc carbonate, which can then be filtered out before the pH is lowered again. However, considering the value of this type of solution, it is questionable whether it is worth the trouble.

Colored Finishes

Question: Enclosed are some steel pins which we lacquer in various colors as per sample. These are only a few colors — others are brown, green, yellow, etc. The amounts lacquered vary in quantities from 3,000 to 100,000 and must be racked one by one.

My question is this: Is there a dye or electroplating method which would color these parts rather than individual racking, as this is time-consuming and tedious.

J. E. C.

Answer: If the pins are zinc plated and chromated, dyes of various colors can then be applied to the surface.

The zinc can be plated in a barrel, thus avoiding racking. However, the dye colors will be transparent rather than opaque, and will not simulate the enameled finish.

Science for Electroplaters

56. High-Efficiency Copper Cyanide

By L. Serota

HIGH-EFFICIENCY or high-speed copper cyanide baths, introduced commercially in 1938, are characterized by a high metal concentration, a low free cyande content, and a high concentration of potassium (or sodium) hydroxide. If, in addition, suitable brighteners, and surface active agents to prevent pitting, are included in the bath, bright, smooth deposits up to 0.002 inch in thickness may be obtained at a cathode current density of 10-60 amp./ft.^{2} (185°F.) with an efficiency of 95-100 per cent in agitated baths. The use of higher current densities is possible if solution circulation is combined with bath agitation, a procedure permitting rapid replacement of the solution (electrolyte) film at the cathode surface.

Function of Constituents

The low free cyanide ratio, according to F. P. Opling, will result in little chemical or thermal decomposition, an effect especially pronounced when the anode efficiency is maintained at approximately 100 per cent and high purity anodes are used. The high anode efficiency prevents electrolytic oxidation. Further, the 100 per cent anode and cathode efficiencies, with virtual complete elimination of gas evolution, avoids spray and harmful fumes.

H. L. Benners and C. J. Wernland note that evidence indicates that a low free cyanide content in the high speed bath is possible because the high concentration of copper salt present, mainly as $Na_2Cu(CN)_3$ with approximately 0.5 oz./gal. free cyanide, dissociates at the operating temperature of 80°C., yielding, by the equilibrium shift, $NaCu(CN)_2$ and NaCN. $Na_2Cu(CN)_3 \rightleftharpoons NaCu(CN)_2 + NaCN$ or, $Cu(CN)_2^{--} \rightleftharpoons Cu(CN)_2^{-} + CN^{-}$. Thus, a sufficient supply of cyanide ions is provided for good anode corrosion, and a means provided for maintaining a solution of the copper compounds. The low cyanide content also avoids the difficulty of cyanide decomposition, an effect experienced with previous types of cyanide baths at high operating temperatures. The free cyanide ratio, the authors report, is important, since an amount exceeding the top limit will cause an appreciable decrease in cathode efficiency and the bright plating range will be reduced. On the other hand if the free cyanide ratio is too low it may cause excessive anode polarization, resulting in rough, irregular deposits.

The high copper (cuprous) ion concentration in this bath, G. B. Hogaboom notes, will cause deposition of copper on steel or zinc by replacement, so that an initial strike from a dilute cyanide copper bath is recommended.

A comparative table of operating conditions for the old type, Rochelle type, and high speed cyanide plating solutions, compiled by Opling (Table 1) emphasizes the advance indicated for the high speed process.

The sodium hydroxide or potassium hydroxide is added to the high speed copper bath to improve conductivity, so that good throwing power is obtained, and to overcome anode corrosion difficulties. Benners and Wermland add that the alkalies, at proper concentration, have a moderate brighening effect. The use of potassium hydroxide in the bath is recommended. The claim is made that the potassium bath will permit the use of even higher current densities than with a sodium solution on an equivalent basis. Wernland claims in a patent (1944) the use of an alkali metal sulfocyanide (thiocyanate) brightener, 0.25 to 8 oz./gal. and an amount of an alkali metal cyanide equivalent to a sodium cyanide to copper cyanide weight ratio of 1 to 6 mols of sodium ions for each mol of potassium ions. Bair and Swalheim note that a tolerance of as much as 0.3 oz./gal. of zinc metal is possible with the use of the thiocyanate, and that the harmful effects on the plating due to the presence of lead compounds in the bath are also reduced.

A betaine anti-pitting agent, which is a cyclic amine containing one noncyclic hydrocarbon radical of 10 to 20 carbon atoms, was patented by D. A. Holt in 1939. The betaines are re-

TABLE 1

Operating Conditions	*Old Type*	*Rochelle Salt*	*High Speed Process*
Anodes	rolled or cast	rolled or cast	high purity electrodeposited
Anode C.D., amp./ft.^{2}	10-30	10-30	10-30
Anode efficiency, per cent	20-50	20-50	100
Cathode C.D., amp./ft.^{2}	10-25	25-50	10-60
Cathode efficiency, per cent	20-60	20-60	100
Temperature, °C.	30-60	30-60	70-80
Type of deposit	Dull, Mat	Smooth, Mat	Bright, Smooth

TABLE 2

	Preferred composition g./l.	oz./gal.	*Approximate limits* g./l.	oz./gal.
Copper cyanide	120	16	90-150	12-20
Sodium cyanide	135	18	100-170	13.5-22.5
Free NaCN	3.75	0.5	3.75-11.25	0.5-1.5
Caustic soda	30	4	22.5-37.5	3-5
or				
Caustic potash	42	5.6	31.5-52.5	4.2-7
Brightener	15	2	11.1-18.7	1.5-2.5
Anti-pit agent	1.5	0.2	1.2-1.8	0.15-0.25

TABLE 3. *Operating Conditions*

Cathode current density	10-100 amp./ft.^{2}
Anode current density	5-30 amp./ft.^{2}
E.M.F. on still tanks	1-2.5 volts at bus bars
E.M.F. on barrel units	3-4 volts
Rate of copper deposition	8.8 amp./ft.^{2} deposits 0.001 in./hr.
Cathode efficiency	100% approximate
Anode efficiency	100% approximate
Temperature	75-85°C.
Cathode bar agitation	2-15 ft./min.
Anode-cathode ratio	Approx. 2:1

ported to be effective anti-pitting agents in concentrations as low as 0.07 g./l. with the recommended limits of 0.01 to 1 oz./gal. Pitting in the high efficiency copper cyanide bath may be the result of hydrogen or air bubbles adhering to the cathode surface.

The initial effort in the development of high efficiency baths is generally associated with the basic work of L. C. Pan with a typical bath consisting of an all-sodium formulation of the following composition: cuprous cyanide, 16 oz./gal.; free sodium cyanide, 0.75-1.5 oz./gal.; caustic soda, 3.0-5.0 oz./gal. Carbonates over 10 oz./gal. in baths of this type are harmful.

Bath Formulation

A number of proprietary high efficiency and bright copper baths are available. The following composition and operating conditions for a high efficiency copper cyanide bath are recommended by Benners and Wernlund (Tables 2 and 3). Potassium formulations or mixed sodium-potassium are used. The potassium bath, it is claimed, permits the use of a higher current density than a sodium solution on an equivalent basis, and is more tolerant to organic impurities.

B. D. Ostrow, in METAL FINISHING GUIDEBOOK, 1958, refers to the emphasis in recent years on high speed, brilliant copper deposits from baths operating with and without tartrates. The composition of such baths is given in Table 4. The baths operate at a current density up to 80 amp./ft.^{2}, at a temperature of 140-160°F., with either air or cathode rod agitation. The claim is made that carbonate control or removal is not necessary and that such baths may be operated with or without wetting agents. In the absence of wetting agents continuous carbonate treatment is necessary. Bright, low current density baths (25 amp./ft.^{2}) with basic formulation similar to the baths operating at 140°-150°F. with tartrates or tartrate type material have also been described.

TABLE 4

Sodium		
Copper cyanide	10.0	oz./gal.
Free sodium cyanide	0.75-1.0	"
Caustic potash	2.0	"
Tartrate or Rochelle salt	6.0	"
Potassium		
Copper cyanide	6.0	oz./gal.
Free potassium cyanide	1.25-1.50	"
Caustic potash	2.0	"
Tartrate or Rochelle salt	6.0	"

Impurities

Cyanide copper baths, particularly those operating at high current densities, are sensitive to organic contaminants. Such impurities cause pitting or streaking and make the deposit hard to buff. The sensitivity to organic contamination may be reduced in the baths by the use of certain wetting agents. Most proprietary solutions provide such wetting, with some exhibiting a free-rinsing characteristic, while others are more difficult to rinse from the plated surface. Continuous carbon filtration is recommended for solutions operating without wetting agents.

All cyanide copper baths, both low and high efficiency, are adversely affected by hexavalent chromium. The effect is a lowering of efficiency and adhesion, and a lowering of the bright range. Some proprietary solutions recommend sodium hydrosulfate, a reducing medium, to change the chromium to the less harmful trivalent state. Some proprietary solutions, with suitable addition agents, show a tolerance for zinc as well as chromium, when present as impurities.

Periodic Reverse-Current

A modification of the high speed bath for the improvement of plating characteristics, entailing a periodic-reverse-current process, has been described by G. W. Jernstadt. By this method, the author claims, the deposit shows superior qualities of strength, elasticity, density, and freedom from flaws such as porosity, and is especially adaptable for depositing thick, dense coats of copper from a cyanide bath.

Essentially, the periodic-reverse-current process consists of a cycle in which the plating current is applied for a period of from 2 to 40 seconds to deposit a microscopic film of metal, after which the current is reversed for a period of from ½ to 5 seconds to remove (deplate) a portion of the previously plated film. This reverse-current period is sufficient to remove the unsound metal that has been plated during the period when the polarity of the work was cathodic. Repetition of the cycle builds up the plate thickness wanted. From 10 to 50 per cent is deplated by reversal of current.

Some of the results obtained by this reverse-current deplating include the following: unsound and inferior metal is removed, producing flat metal surfaces; the surface increment is smoothed progressively with each succeeding increment; the metal surface is brightened by the current reversal, so that hand buffing or polishing is reduced or eliminated; better adhesion is obtained; thickness up to ¼ inch can be produced without surface flaws; the speed of plating can be increased in producing heavy electrodeposits without sacrifice of quality; throwing power is improved.

The illustrations in Figs. 218 and

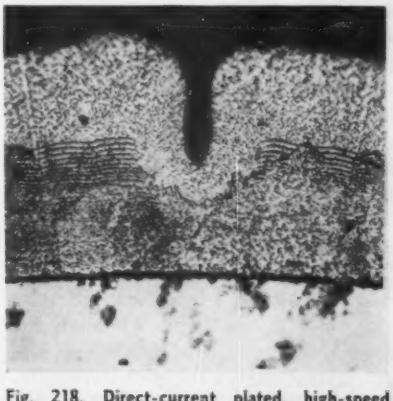


Fig. 218. Direct-current plated, high-speed copper, filtered and agitated solution, 80 A.S.F., 0.006 inch, 45 minutes. X 500.

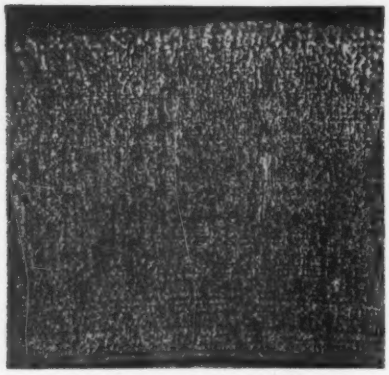


Fig. 219. Periodic reverse-current plated, high-speed copper, filtered and agitated solution, 120 A.S.F. (90 A.S.F. effective), 0.007 inch, 40 minutes. X 500.

219 are offered as evidence of the advantage of the reverse-current process over direct-current plating. Fig. 218 is a photomicrograph of copper, 0.006″ in thickness, deposited from a high speed, filtered and agitated solution, at 80 amp./ft.^{2} for 45 minutes. The cross section shows a pore which was attributed to some foreign substance. The added observation is made that the quality of the copper is better near the surface.

The inclusion of the periodic reverse-current cycle with the same solution and procedure results in a more uniform quality of deposited copper. Fig. 219 is a photomicrograph of the 0.007″ copper plate obtained by the process at 120 amp./ft.^{2} (90 amp./ft.^{2} effective) in 40 minutes.

Filtration and Diaphragms

A difficulty experienced in the deposition of copper from high efficiency cyanide baths, where the plating range extends from 0.00075″ to 0.002″, is roughness, a condition attributed to the settling of insoluble particles on the cathode, especially on horizontal or "shelf" areas. The source of such insoluble particles (copper, copper oxide), investigation showed, is the copper anode. Although cast, rolled, or electrolytic copper anodes may vary in the extent of insoluble particles produced, corrosion of any type of anode has not been attained without some formation of insoluble particles.

Methods employed in overcoming roughness previous to the investigation by the authors, included slower solution circulation, increased filtration rate, and anode bags. Although the respective corrective measures provided an improvement, a more effective method has been suggested for overcoming roughness in a copper cyanide bath. A canvas diaphragm was used to separate the tank into anode and cathode compartments, with the continuous circulation of the plating solution from the anode to the cathode area, through a high efficiency filter, by means of a pump. A smooth deposit, it is claimed, is obtained at high plating speeds.

The effect produced by this pump rate is the development of a hydrostatic head. The pressure thus produced tends to direct the flow from the cathode to the anode compartment, thereby preventing the migration of anode particles into the plating section. Fig. 220 is a diagrammatic representation of this unit.

Copper-Amine Bath

In an effort to eliminate the instability as well as the toxic effect of the cyanide bath and, at the same time, avoid the poor throwing power of the acid copper solution, the electrodeposition of copper from complex copper-amine solutions (cyanide-free baths) was studied by a number of workers. C. J. Brockman and co-workers were early investigators of complex solutions containing mono, di and triethanolamine, ethylene diamine, and diethyl triamine. The addition of sodium oxalate with the ethanolamines was found to be necessary.

A recent study of copper deposition on steel from a mono-ethanolamine bath, by T. L. Rama Char and H. B. Shivaraman, indicated satisfactory results when Rochelle salt was added to an ethanolamine bath. Bright, smooth, fine-grained deposits were obtained. Copper did not deposit from this solution on steel by immersion, a factor attributed to the decreased metal ion concentration of the bath (from 1.90×10^{-11} to 3.16×10^{-13}N) resulting from the added complexes formed with the addition of the 60 g./l. Rochelle salt. The optimum composition and conditions were found to be as follows: Copper oxalate, 60 g./l.; monoethanolamine, 60 ml./l.; Rochelle salt, 60 g./l.; 2.4-4.8 amp./dm.^{2}; pH 9.5; 24°C.

The use of Rochelle salt in the bath, it was found, aided anode corrosion by overcoming blackening of the anodes at high current density, reduced bath voltage, increased the current density range, conductivity, cathode polarization, and throwing power, as well as eliminating treeing and increasing the brightness.

The addition of ammonium, potassium or sodium nitrate (5 g./l.), though increasing the brightness and the limiting current density range from 4.8 to 6.0 amp./dm.^{2}, reduced the cathode efficiency to 58-80 per cent, compared to an efficiency close to 100 per cent without the addition agent. Other addition agents investigated, such as ammonia, ammonium sulfate, chloride and carbonate, as well as sodium chloride, exhibit a minimal, if any, effect.

The advantage cited for the copper-amine bath over the cyanide bath include: wide current density range, high cathode efficiency, brighter deposits, room temperature operation; absence of addition-agents; stability; avoidance of poisonous fumes. The cyanide bath, however, exhibits higher conductivity and cathode polarization as well as better throwing power. The rate of copper deposition, it was found, ranged between that for low concentration cyanide bath and the "high efficiency" cyanide bath without brightener. I. S. Hallows states that the amine bath finds its main use commercially for plating zinc-base die-castings, aluminum, and steel. Deposition of bright nickel or chromium usually follows.

Pyrophosphate Bath

The use of an alkaline pyrophosphate copper (cupric) plating solution, based on the formation of the highly soluble compound sodium or potassium pyrophosphate ($Na_4P_2O_7 \cdot 10H_2O$; $K_4P_2O_7 \cdot 3H_2O$), though known for a long time, gained commercial impetus with its introduction in 1941, by J. E. Stareck.

The copper in this solution is present, according to Stareck, as the complex anion, $Cu(P_2O_7)^=$. An excess of pyrophosphate is recommended to increase the current density and aid

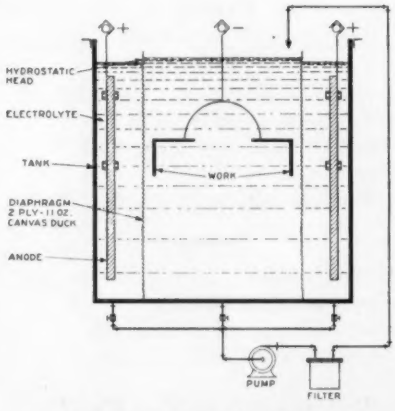


Fig. 220. Diaphragm Installation.

TABLE 5

OPTIMUM RANGE OF BATH COMPONENTS

Constituent	g./l.	oz./gal.
Copper	22-38	3-5
Pyrophosphate	150-250	20-33⅓
Oxalate	15-30	2-4
Nitrate	5-10	⅔-1⅓
Ammonia	1-3	⅛-⅜

anode corrosion. In addition, a small amount of ammonia (about ¼ oz./gal.) serves to improve anode corrosion and add luster to the deposit. Dibasic organic acids (lactic, tartaric, malic, oxalic) or their ammonium or alkali salts, were found by Stareck to be suitable as brighteners. These brighteners, it is claimed, will also increase the maximum allowable current density and conductivity. Other brighteners and addition agents listed for this bath include the disulfonic acids of phenol or naphthalene and the chlorides of As, Bi, Fe, Cr, Sn, Zn, Cd, Pb and alkali metals.

The bath is agitated, preferably by air. This procedure, especially at high temperature, will result in the loss of ammonia, which must be replaced. The solution pH is maintained between 8.2 and 8.8; otherwise anode corrosion is affected if the pH is too high, and throwing power and complex stability are reduced when the pH becomes too low. Filtration, preferably continuous, is advisable. The solution is not sensitive to common solution impurities other than lead, free cyanide, and oil. These impurities will cause streaky and dull deposits as well as affecting the current density range. Removal of cyanide is affected by the use of hydrogen peroxide. Cathode and anode efficiencies are close to 100 per cent.

In addition to the use of the pyrophosphate bath for bright copper plating, I. S. Hallows indicates that an extensive use of the bath is in masking processes, as in case hardening, for plating areas which are not to be case hardened. This is a superior substitute for the previously employed cyanide copper bath. The advantage claimed for the pyrophosphate bath is that this bath shows less tendency to strip the lacquer, which served as a stop-off for the steel parts to be subsequently case hardened, than does the cyanide. Thus, it is noted, the advantages of the acid and cyanide copper baths are possible with the pyrophosphate bath.

The bath composition and operating conditions for optimum results, Tables 5 and 6 are those given by Stareck. A wide range of concentrations, temperatures and current densities is possible.

TABLE 6

OPTIMUM OPERATING CONDITIONS

pH	8.2-8.8
Ratio P_2O_7/Cu	7.0-8.0
Temperature	50-60°C.
Voltage	1.5-4
Current density	10-75 amp./ft.^{2}
Current efficiency	100% approx.
Anode to cathode ratio	1/1-2/1
Air agitation (per sq.ft. of surface)	1-1½ cu.ft./min.

Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD

PRINTED COPIES OF PATENTS are furnished by the Patent Office at 25 cents each. Address orders to the Commissioner of Patents, Washington 25, D. C.

Low Stress Rhodium

U. S. Patent 2,895,889. *July* 21, 1959. *K. Schumpelt, assignor to Sel-Rex Precious Metals, Inc.*

A process of electroplating rhodium metal under low internal stress comprising electrodepositing rhodium upon a basis metal from an aqueous bath consisting essentially of 20-100 cc. per liter of free sulfuric acid, 2 to about 5 grams per liter of rhodium added as rhodium sulfate and 10-100 grams per liter of magnesium sulfate, the remainder being water, electrodepositing rhodium from said bath at a current density of from 4 to 20 amperes per square foot and at a temperature of about 20° C. to about 50°C.

Low Stress Rhodium

U. S. Patent 2,895,890. *July* 21, 1959. *K. Schumpelt, assignor to Sel-Rex Corp.*

The process which comprises electrodepositing rhodium upon a basis metal from an aqueous bath containing rhodium sulfate and 10-100 g. per liter of magnesium sulfamate dissolved therein.

Belt Polisher

U. S. Patent 2,896,378. *July* 28, 1959. *J. H. Keating, assignor to Monarch Aluminum Mfg. Co.*

Belt finishing apparatus comprising a frame; a vertical shaft rotatably supported thereon; an article holding chuck on said shaft; motor means to rotate said shaft a plurality of revolutions per workpiece finishing cycle; a plurality of supporting brackets mounted on said frame; an arm pivotally mounted on each bracket for pivotal motion about an axis; a plurality of pulleys carried by each arm; an abrading belt supported by the pulleys of each arm; means to rotatably drive said belts; and cam means to sequentially cause said arms to move toward and away from said chuck in predetermined and non-overlapping order, whereby only one abrading belt is in engagement with said chuck at any given time.

Humidity Tester

U. S. Patent 2,897,060. *July* 28, 1959. *E. A. Dieman, assignor to Standard Oil Co.*

A humidity test apparatus of the type comprising cabinet means for maintaining a humidity atmosphere at an elevated temperature, and a rotating stage within said cabinet means, said stage having means for supporting a plurality of test panels, the improvement which comprises heat exchanger means integral with a test panel on such rotating stage.

Lime Buffing Compound

U. S. Patent 2,897,075. *July* 28, 1959. *P. Gibson and B. J. Bogdanoff, assignors to Swift & Co.*

A new lime based buffing compound which comprises: a binding material containing a fatty acid selected from the group consisting of stearic acid, palmitic acid, and mixtures thereof, a lime based buffing compound, and at least about 0.01% of a fat antioxidant

selected from the group consisting of di-tertiary-butyl-para-cresol, diphenylamine, beta naphthol, butylated hydroxy anisole, and propyl gallate.

Gas Plating

U. S. Patent 2,896,570. *July* 28, 1959. *H. R. Nack, H. J. Homer and J. R. Whitacre, assignors to The Commonwealth Engineering Co. of Ohio*

A machine for gas plating metal onto long continuous length flexible filaments or strands of material as the same is continuously moved lengthwise and without impairing the flexibility and physical characteristics of the material.

Automatic Degreaser

U. S. Patent 2,896,640. *July* 28, 1959. *M. Randall and M. Randall, assignors to Ramco Equipment Corp.*

The combination of a tank for holding degreasing liquid, a container for receiving a supply of degreasing vapor, and a degreasing vapor generating means arranged to supply such vapor into said container.

Plating Powder Compacts

U. S. Patent 2,897,097. *July* 28, 1959. *M. F. Smith and H. F. Latva, assignors to The Bunting Brass Co.*

The method of preparing a porous sintered metal article for plating which comprises immersing the article in melted microcrystalline wax which is solid at room temperature to fill the surface pores and cover the surface of the article, cooling the article to harden the filler material, tumbling the article in a bath of detergent material at a temperature at which said filler material remains hard, said bath containing chips of natural or synthetic rock-like material, and cleaning the article in a pre-plating solution at a temperature at which said filler material remains hard.

Plating on Thorium

U. S. Patent 2,897,124. *July* 28, 1959. *J. G. Beach and G. R. Schaer, assignors to the United States of America*

The method of pretreating a thorium surface prior to electroplating which comprises vapor blasting the surface, anodically pickling in a 5 to 15% by volume aqueous hydrochloric acid bath with a curent of 125 to 250 amperes per square foot for 3 to 5 minutes at room temperature, chemically pickling the surface in a 5 to 15% by volume of aqueous sulfuric acid for 3 to 5 minutes at room temperature, and then rinsing the surface with water.

Anodizing Aluminum

U. S. Patent 2,897,125. *July* 28, 1959. *J. B. Franklin, assignor to Sanford Process Co., Inc.*

A process for coating aluminum and aluminum alloy metal articles with a hard and tough coating of oxide of aluminum, which comprises passing an electric current through an electrolytic cell containing an electrolyte maintained at a reduced temperature with said article forming the anode, said electrolyte comprising a water solution of an electro-anodizing acid, establishing the voltage applied across said cell at a value in a range operative to produce a measurable coating of oxide of aluminum on the article without burning, establishing said applied voltage at successively higher values by voltage increments, each said voltage increment being chosen to reestablish approximately the current initially obtained at the first-mentioned voltage, and maintaining the voltage at each said established value until said current decreases by a material percentage.

Plating Printed Circuits

U. S. Patent 2,897,409. *July* 28, 1959. *J. J. Gitto, assignor to Sprague Electric Co.*

A terminal board for a printed circuit assembly comprising in combination a plural layer conductive coating composed of metal particles selected from the group consisting of copper, nickel, iron, zinc and aluminum in a suitable vehicle and having a particle size of less than about 250 mesh, an electrodeposited conductive layer overlying said underlayer forming the outer layer of said plural layer coating, a resinous dielectric base carrying said plural layer coating, conductors on exposed surfaces of said resinous dielectric base connected by said plural layer coating and an aperture through said base containing said plural layer coating, and an exposed surface on said aperture covered by said underlayer whereby the conductors on each surface of said base are connected by said plural layer coating and a conductive layer of non-migratory particles is in contact with said exposed area of said base.

Gold Plating Process

U. S. Patent 2,897,584. *Aug.* 4, 1959. *K. Schumpelt, assignor to Sel-Rex Corp.*

As an article of manufacture which is resistant to corrosion and to tarnishing by diffusion, a basis metal, a layer of silver deposited on said basis metal, a layer of gold about .00001" to .00002" thick on the outside surface thereof and a layer of about .0000025" to .000005" in thickness of a barrier metal selected from the group consisting of platinum, ruthenium, rhodium and palladium between the silver layer and the gold layer, said barrier metal layer being bonded to said silver at one side and to the gold layer at the other side thereof.

Hot Galvanizing

U. S. Patent 2,897,588. *Aug.* 4, 1959. *H. Chapman, assignor to General Steel Wares Ltd.*

A method of galvanizing a sheet metal article coated with a layer of the oxide of the metal and having areas selected for joining parts of the article by welding, comprising the steps of covering the said selected areas with a masking material impervious to an acid pickling bath and destructible by a galvanizing bath containing molten zinc, pickling the article in the pickling bath to remove the oxide coating from the remaining areas and retain the oxide coating under the masked selected areas, and immersing the article in the galvanizing bath whereby the said remaining areas are galvanized and the retained oxide coating on the said selected areas keeps them in a zinc-free condition for welding, the masking material being substantially wholly destroyed before the galvanizing step is completed.

Pickling Aluminum

U. S. Patent 2,901,334. *Aug.* 25, 1959. *M. H. Brown, assignor to Aluminum Co. of America*

The method of removing iron impurities from a surface of an aluminum article which comprises treating said surface with an aqueous solution consisting essentially of at least 0.05 per cent by weight of soluble citrate ion and at least 0.005 per cent by weight of soluble sulfite ion, and having a pH below about 7.0.

Pickling Aluminum

U. S. Patent 2,901,344. *Aug.* 25, 1959. *M. H. Brown, assignor to Aluminum Co. of America*

The method of removing iron impurities from a surface of an aluminum article which comprises treating said surface with an aqueous solution consisting essentially of at least 0.1 per cent by weight of soluble citrate ion and at least 0.1 per cent by weight of soluble nitrate ion, and having a pH below about 2.75.

Gas Plating

U. S. Patent 2,898,227. *Aug.* 4, 1959. *F. E. Drummond, assignor to The Commonwealth Engineering Co. of Ohio*

A method of gas plating objects with zinc metal which consists in heating the object to be zinc plated to the decomposition temperature of a heat-decomposable gaseous zinc metal compound, and contacting said heated object with said gaseous zinc compound contained in carbon dioxide carrier gas to cause thermal decomposition of said zinc metal compound and deposition of zinc onto the surface of said object, said zinc metal compound being zinc acetylacetonate.

Gas Plating

U. S. Patent 2,898,230. *Aug.* 4, 1959. *J. J. Bulloff, assignor to The Commonwealth Engineering Co. of Ohio*

The process of providing a metal coated, oxide-free aluminum body which comprises subjecting a body of aluminum having an oxide coating thereon to fused cryolite to remove the said oxide coating and to leave a body of substantially pure aluminum, contacting said oxide-free aluminum body with vapors of an oxygen-free metal bearing compound while providing the aluminum at a temperature to react with the metal bearing compound to produce a volatile aluminum compound and a metal deposit of the metal of the compound on the aluminum body, removing the volatile aluminum compound as it is formed to provide an aluminum body having an adherent coating of metal thereon which is resistant to oxidation and which inhibits oxidation of the aluminum body.

Gas Plating

U. S. Patent 2,898,234. *Aug.* 4, 1959. *H. R. Nack and J. R. Whitacre, assignors to The Commonwealth Engineering Co. of Ohio*

A gas plating process for a ferrous base metal which comprises heating the base metal under vacuum conditions to a temperature of about 250-400°F., contacting the base with gaseous nickel carbonyl to effect deposition of nickel on the base metal, contacting this freshly deposited nickel under substantially the same temperature and vacuum conditions and without interruption of the conditions with a gaseous mixture of chromium hexacarbonyl and nickel carbonyl to deposit on the nickel a combination layer of chromium and nickel, cutting off the flow of nickel carbonyl, and increasing the flow rate of the chromium carbonyl to deposit a layer of chromium on the combination layer.

Gas Plating

U. S. Patent 2,898,235. *Aug.* 4, 1959. *J. J. Bulloff, assignor to The Commonwealth Engineering Co. of Ohio*

In a process of gas plating wherein the substrate to be plated is heated to a temperature sufficient to cause decomposition of a volatile metal compound brought in contact therewith, the step of bringing a gaseous metal bearing poly-enyl compound in contact with said substrate while the latter is heated above the decomposition temperature of said compound and under a non-oxidizing atmosphere to cause decomposition of the gaseous metal compound and deposition of metal onto the surface of the substrate.

Paint Stripper

U. S. Patent 2,898,246. *Aug.* 4, 1959. *A. Hannah, assignor to Wyandotte Chemicals Corp.*

A process for removing oleoresinous, ester gum and alkyd resin based paints from articles coated therewith which comprises contacting said coated articles with a hot, aqueous paint stripping solution maintained at a temperature of about 200°F. and consisting of about 85 to 98 per cent by weight of water and about 2 to 15 per cent by weight of a stripping composition consisting essentially of at least about 70% by weight of sodium hydroxide, about 2 to 10 per cent by weight of a polyhydric alcohol conforming to the formula

$$CH_2OH(CHOH)_nCH_2OH$$

wherein n has a value from 3 to 5, inclusive, about 2 to 4 per cent by weight of a wetting agent selected from the group consisting of fatty acid soaps, rosin soaps, alkylarylsulfonates, petroleum sulfonates, sulfonated castor oil and mixtures thereof, and wherein up to about 25% by weight of said stripping composition is sodium carbonate.

Conversion Coating for Aluminum

U. S. Patent 2,898,250. *Aug.* 4, 1959. *G. H. Pimbley, assignor to Turco Products, Inc.*

A process for producing a substantially colorless chemically bonded coating on an aluminum article, which comprises treating said article in an aqueous solution containing a small effective amount of a soluble compound containing unsaturated tetravalent carbon linked to nitrogen and to an element of the group consisting of oxygen and sulfur.

Electroforming Wave Guides

U. S. Patent 2,898,273. *Aug.* 4, 1959. *L. H. La Forge, Jr., R. B. Neal, and R. N. Whitehurst, assignors to The Leland Stanford Jr. University*

The method for making disc-loaded waveguides, comprising the steps of positioning threads to extend into discoid grooves of a circumferentially grooved cylindrical plating core, electroplating metal onto said plating core, said metal substantially filling said grooves and covering said core to form a plurality of annular discs of said metal transversely disposed within and unitary with a cylinder of said metal, said discs containing internal cavities and said threads extending from said cavities through said metal plated on the said core, dissolving said plating core, and removing said threads.

Plating Rack

U. S. Patent 2,898,285. *Aug.* 4, 1959. *R. O. Henson, assignor to General Motors Corp.*

An electroplating bath fixture comprising a support for the workpiece to be electroplated and a robber bar connected to said support and positioned adjacent the normal position for the workpiece, said robber bar including a metal member having a coating of organic polymeric nonconducting material thereon, a layer of conducting material on said nonconducting coating, said layer comprising a mixture of metal powder and a binder of organic polymeric material, and means extending through said nonconducting coating establishing electrical contact be-

tween said metal member and said conducting layer.

Zinc-Tin Bath

U. S. Patent 2,898,274. *Aug.* 4, 1959. *E. B. Saubestre and A. D. Arnaut, assignors to Sylvania Electric Products Inc.*

A cyanide-type of plating bath for depositing a zinc-tin alloy comprising in solution zinc, tin, a cyanide ion source and a hydroxide ion source, the cyanide ion being present in an amount less than that required to complex all of the zinc as cyanozincate ion, the total amount of cyanide ion and hydroxide ion being sufficient to complex all of the zinc.

Rust Preventive

U. S. Patent 2,898,301. *Aug.* 4, 1959. *R. L. Mayhew, J. P. Copes and E. P. Williams, assignors to General Aniline & Film Corp.*

An anti-rust composition comprising a fluid petroleum hydrocarbon containing a rust inhibiting amount of at least one N-substituted - γ - hydrocarboxylic acid amide.

Electrostatic Painting Apparatus

U. S. Patent 2,899,136. *Aug.* 11, 1959. *H. J. Reindl, assignor to General Motors Corp.*

In combination with a centrifugal distributor for a solvent containing paint wherein paint is supplied to the distributor adjacent the center thereof and is distributed therefrom during rotation thereof; a distributor cup having a closed bottom positioned concentric with the geometric center of said distributor, a lip on said cup, a paint supply tube extending into the top edge of said cup and opening below the lip and fixed with respect to said cup, said paint supply tube being adapted to supply paint to said cup which then overflows from the cup and over said lip onto said distributor for centrifugal distribution over the surface of the distributor.

Buffing Composition

U. S. Patent 2,899,289. *Aug.* 11, 1959. *L. B. High, assignor to The Udylite Research Corp.*

An improved buffing composition comprising in weight per cent about 70% to about 80% lime, about 10% to about 20% long chain saturated fatty acid, about 1% to about 6% petrolatum, about 2% to about 5% tallow and about 0.1% to about 5% of at least one tertiary amine consisting of carbon, nitrogen and hydrogen and containing at least five carbon atoms.

Buffing Composition

U. S. Patent 2,899,290. *Aug.* 11, 1959. *W. L. Riegler and J. N. Dybalski, assignors to Armour and Co.*

An improved lime buffing composition conatining as an anti-slaking additive from about 2 to 7 weight per cent of a mixture containing 6 to 10 parts by weight of N-tallow-trimethylene diamine per part of N-bis(2-hydroxyethyl)-soya amine.

Gas Plating

U. S. Patent 2,899,332. *Aug.* 11, 1959. *G. A. Samuel, assignor to Metal Diffusions, Inc.*

The method of chromizing ferrous metal parts, which comprises first prereacting together ammonium bifluoride and chromium to form a complex compound of ammonium, chromium and fluorine, drying the complex compound and then placing said dry compound, chromium and ferrous metal parts in a closed retort, with the said compound and the said chromium in contact with the ferrous metal parts and maintaining the contents of the retort at a temperature between 1,650 and 2,300 degrees F.

Sealing Anodized Aluminum

U. S. Patent 2,899,368. *Aug.* 11, 1959. *R. C. Spooner, assignor to Aluminium Laboratories Ltd.*

A method of sealing anodically formed aluminum oxide coatings on a metal selected from the group consisting of aluminum and aluminum-base alloys comprising immersing the coated metal in a bath containing an aqueous solution of at least one of the group consisting of sodium molybdate, potassium molybdate and ammonium paramolybdate, the said solution being held at a pH value within the range 5.8-8.0 and a temperature above 90°C.

Corrosion Preventive

U. S. Patent 2,899,391. *Aug.* 11, 1959. *R. L. Mayhew and C. F. Jelinek, assignors to General Aniline & Film Corp.*

A corrosion preventing composition consisting essentially of a major proportion of a liquid petroleum hydrocarbon and a corrosion inhibiting amount of an acetylenic alcohol fatty acid ester.

Corrosion Preventive

U. S. Patent 2,900,262. *Aug.* 18, 1959. *H. A. Green, assignor to Quaker Chemical Products Corp.*

A liquid corrosion preventive composition for metal surfaces consisting essentially of a petroleum hydrocarbon and the reaction product of from 1 to 15 parts by weight of a petroleum hydrocarbon oxidate with 1 part by weight of the product obtained from condensation under dehydrating conditions of about 1 to 2 mols of a mono carboxylic acid containing from 8 to 22 carbon atoms and about 1 mol of a polyalkylene polyamine.

Hot Dipping

U. S. Patent 2,900,273. *Aug.* 18, 1959. *H. E. Linden, assignor to American Mollerizing Corp.*

A method of coating a continuously moving material with a molten coating metal which includes the steps of: passing said material into a molten salt bath; vibrating said material while in said salt bath, the vibratory motion imparted to said material being substantially dampened by said salt bath prior to the exit of said material from said salt bath; and thereafter passing said material from said salt bath directly into said molten metal.

Addition Agent for Plating Baths

U. S. Patent 2,900,313. *Aug.* 18, 1959. *E. B. Saubestre and E. P. Bulan, assignors to Sylvania Electric Products, Inc.*

A process for plating of metals from an alkaline plating bath including cyanide ion and hydroxide ion, which comprises increasing the speed of operation by adding an addition agent consisting of ammonium molybdate in a concentration of one to three ounces per gallon of said bath and at least one ingredient selected from the group consisting of gelatine in the range of from one-eighth to one-half ounce per gallon of bath and glycerine in the range of from one to two ounces per gallon of bath and passing current through said bath at a current density in the range from 80 to 225 amperes per square foot of cathode.

Bright Tin-Zinc Bath

U. S. Patent 2,900,314. *Aug.* 18, 1959.
E. B. Saubestre, assignor to Sylvania Electric Products, Inc.

A process for producing a solderable, bright zinc-tin deposit by electrodeposition from a zinc-tin plating bath containing cyanides and hydroxides which consists in adding only the following: gelatin and ammonium molybdate, each of said additives being present in a concentration of between one-eighth to two ounces per gallon.

Duplex Electrodeposits

U. S. Patent 2,900,707. *Aug.* 25, 1959.
H. Brown, assignor to The Udylite Corp.

A metallic bright protective coating on a metallic base consisting of a firmly adherent layer of a lustrous nickel deposit having a thickness in the range of about 0.5-2 mils, and a layer overlying said lustrous nickel deposit consisting of a nickel alloy and having a thickness of about 0.05-1 mil, said nickel alloy being an alloy of nickel with at least one metal selected from the group consisting of cobalt and iron and containing at least 50% nickel, the cobalt, when present, being present in an amount of about 10% to 50%, and the iron, when present, being present in an amount less than 40%.

Electrostatic Spraying

U. S. Patent 2,901,177. *Aug.* 25, 1959.
E. O. Norris

A spraying apparatus for ionizing and atomizing a sprayable material comprising an elongated tubular holder, a rotary spray head of electrical insulating material having an outwardly flaring film supporting surface terminating in a peripheral discharge edge, and a feed conduit secured to said holder in position to feed sprayable material onto the central portion of said surface.

Electrostatic Spraying

U. S. Patent 2,901,178. *Aug.* 25, 1959.
E. O. Norris

Apparatus for producing an ionized spray of sprayable material, comprising a rotary spray head including a pair of frusto conical members of electrical insulating material forming a confined area therebetween and having peripheral edges spaced to provide therebetween a peripheral discharge opening and a radial member of electrical insulating material disposed between said first members to divide said confined area into two separate chambers.

Degreasing Method

U. S. Patent 2,901,383. *Aug.* 25, 1959.
K. Lebsanft and E. S. Schmidt, assignors to Wacker-Chemie G.m.b.H.

Process for cleaning objects which comprises treating them with a chlorinated aliphatic hydrocarbon containing finely divided particles of polyvinyl chloride, and subsequently rinsing the cleaned objects in a chlorinated aliphatic hydrocarbon to remove the polyvinyl chloride particles.

Plating on Beryllium

U. S. Patent 2,901,408. *Aug.* 25, 1959.
R. G. Townsend, assignor to the United States of America

A method of protectively coating beryllium metal which comprises the steps of etching said metal in an acid bath, immersing the etched beryllium in a solution of sodium zincate for a brief period of time, immersing the beryllium in concentrated nitric acid, immersing the beryllium in a second solution of sodium zincate, electroplating a thin layer of copper over said beryllium, and finally electroplating a layer of chromium over said copper layer.

Conversion Coating

U. S. Patent 2,901,385. *Aug.* 25, 1959.
L. P. Curtin

Process for producing an adherent, micro-crystalline chromite-phosphate bonding coat on ferrous metal surfaces which comprises the following sequence of steps: (1) wetting the metal surface with a solution containing a dichromate selected from the class which consists of barium, calcium, magnesium and zinc dichromates, the solution also containing a reducing agent for said dichromate present in amount sufficient to reduce substantially completely the hexavalent chromium present, the solution also containing a phosphoric acid compound selected from the class which consists of barium, calcium, magnesium and zinc dihydrogen phosphates and free phosphoric acid, the phosphate being less in amount that the dichromate in the solution, and (2) destroying substantially completely hexavalent chromium compounds and reducing agents present in the film of said dichromate solution adhering to the metal surface by heating to a temperature above 100°C., the residue remaining on the metal surface constituting an adherent, micro-crystalline, chromite-phosphate bonding coat.

Anodizing Magnesium

U. S. Patent 2,901,409. *Aug.* 25, 1959.
H. K. De Long, assignor to The Dow Chemical Co.

An anodizing bath consisting of an aqueous solution of water-soluble inorganic compounds yielding in the aqueous solution the radicals; ammonium, fluoride, phosphate, sodium, and hexavalent chromium, the amount by weight of the ammonium radical being between 3.2 and 15 per cent, that of fluoride radical being at least 6 per cent, that of the phosphate radical calculated as PO_4 being between 2 and 10 per cent, that of the sodium radical being between 0.3 and 5 per cent and that of the hexavalent chromium radical being between about 0.3 and 5 per cent, and sufficient mineral acid to give the solution a pH between 0.5 and 4.

Emulsion Cleaner

U. S. Patent 2,901,433. *Aug.* 25, 1959.
S. Spring, assignor to Pennsalt Chemicals Corp.

A cleaning composition comprising by weight, from about 1% to about 50% of a soap selected from the group consisting of the alkali metal, ammonium, amine and alkanol amine salts of the fatty and rosin acids, from about 5% to about 80% water; from about 1% to about 50% of an organic acid selected from the group consisting of rosin acids, and fatty acids having from about 6 to about 26 carbon atoms; from about 6% to about 90% of an organic solvent selected from the group consisting of hydrocarbon solvents having a boiling point range between about 75°C. and about 400°C., carbon tetrachloride, perchloroethylene and trichloroethylene; and at least about 0.05% of a neutral alkali metal salt of a mineral acid selected from the group consisting of sulphuric acid, hydrochloric acid and chromic acid.

Conversion Coating

U. S. Patent 2,901,821. *Sept.* 1, 1959.
W. H. Ross, Jr., assignor to Detrex Chemical Industries, Inc.

A composition of matter for coating

aluminum or its alloys to protect the metal against atmospheric oxidation prior to welding consisting essentially of an acidic aqueous solution of benzoic acid and alkali metal dihydrogen phosphate, said solution having a pH of about 4.4 to 5.5, and said benzoate being present in a substantial quantity to react with aluminum to form an aluminum benzoate coating.

Anodizing Aluminum

U. S. Patent 2,901,412. *Aug.* 25, 1959. *N. Mostovych and A. Cybriwsky, assignors to Reynolds Metals Co.*

An anodizing apparatus comprising: a first unit including a first shunt-resistor rectifier and a first tank for containing an electrolyte for anodizing an aluminum surface immersed in said electrolyte, said tank having cathode and anode terminals; a second unit substantially similar to said first unit, said second unit including a second shunt-resistor rectifier and a second anodizing tank having cathode and anode terminals; an alternating current source having first and second power terminals and a common terminal; means electrically connecting both anode terminals to said common terminal; and means electrically connecting said first power terminal serially through the second rectifier to the cathode terminal of the second tank, each rectifier constituting a means for restricting the inverse current flowing through it to a value substantially less than that of the anodizing current flowing therethrough.

Abrasive Blast Machine

U. S. Patent 2,901,867. *Sept.* 1, 1959. *W. M. Bolton and R. L. Ruse, assignors to The Commonwealth Engineering Co. of Ohio*

In combination in abrading apparatus; a housing; a bowl on the lower end of the housing for retaining a liquid suspension containing an abrasive, the housing having apertures above the bowl for the passage transversely of the housing of an elongated element; retaining means on either side of said housing for retaining an elongated element passed through the apertures of the housing; a slide for each of said retaining means, the slides being mounted for movement in one rectilineal direction together whereby said wire may be moved through the housing in one direction, means carried by one of the slides operably connected for driving the element in rotation: other means operably connected with one of the slides for driving the slides in rectilineal movement, and a nozzle communicable with the bowl and positioned to direct a spray of the suspension to an element passing through the apertures of the housing.

Spray Washer

U. S. Patent 2,904,053. *Sept.* 15, 1959. *G. L. Henzel, assignor to Cobehn, Inc.*

A high velocity spray cleaning apparatus having a high velocity atomizer nozzle provided with inlets for hot air under pressure and a cleaning solvent respectively.

ABSTRACTS

Electroplating of Tin-Nickel Alloys from Chloride-Fluoride Solutions

K. M. Ijutina and N. T. Kudrjawzew: *Dokl. Akad, nauk SSSR* (Russia), **115**, #3, 580-582.

On the basis of polarization measurements, the following data are given for the electrodeposition of tin-nickel alloys with about 50% tin. The following bath is proposed: 2.5 N $NiCl_2$ + 0.5 N $SnCl_2$ + 1.5 N NH_4F + 0.5 N p-phenolsulfonic acid; pH 4.5; 50°-70° C.; cathode current density 0.5 to 4.0 amp./dm.^{2} Tin-nickel anodes are used with a surface ratio of 1:20.

Influence of Gelatine on the Deposition of Copper Coatings

J. W. Lyslow: *Zurnal fiz. Chim.* (Russia), **31**, #12, 2720-2724.

Copper was deposited from a 0.5 N copper sulfate solution with 0.01 N sulfuric acid, on a small cathode with the addition of gelatine in the bath. With current densities above a critical value, a smooth deposit was obtained over the whole electrode surface.

Examination of a cross-section of the deposit showed a laminated structure with dark streaks of non-metallic inclusions. With lower current densities, only a part of the cathode surface is active and practically no copper deposition takes place on the passive portion. At these positions, there is formed an absorption coating of gelatine which impedes the metal deposition. Because of the rapid renewal of the surface, this coating of gelatine cannot form at higher current densities.

Mechanical Stresses in Electroplated Palladium Deposits

W. W. Stroumow: *Zurnal fiz. Chim.* (Russia), **31**, #8, 1812-1819.

In palladium deposits which are plated from phosphate solutions, it was found that particularly strong mechanical stresses are present if hydrogen is deposited simultaneously with the palladium. This is the case with high current densities and low palladium concentrations in the electrolyte.

The adsorption of the hydrogen during electrolysis, and its desorption when the current is switched off, can be followed potentiometrically. The mechanical stresses can reach 7,000 kg./cm.^{2} The adsorption of hydrogen, during the simultaneous deposition of palladium and hydrogen, occurs more easily than the action of hydrogen on a palladium coating that has already been formed.

Plating of Zinc Die Castings

D. Gratzke: *Metallwarenindustrie und Galvanotechnik*, **50**, No. 7, 364.

Difficulties and defects are frequently encountered in finishing and electroplating of zinc die castings. The most frequent troubles which are met with in finishing pressure die castings and injection castings are: Flaking electrodeposits, deposits which show small point-size blisters, and black-spot separations. These defects, in most cases, arise from improper pretreatment and from the die casting itself.

Where the plating is applied by an outside contractor, no direct influence on the structure of the casting can be exerted. Accordingly, if possible in such cases, close contact should be maintained with the concern producing the die castings so that casting faults can be ironed out. Grinding should only be used in the simpler cases. Burrs are best removed with a fine abrasive belt. Polishing can be conducted mechanically or electrolytically. An electrozinc plate is then applied. This zinc plate, after mechanical polishing, has the advantage of leveling-off roughness in the die casting and filling surface cracks and pores. A copper plate then follows.

In electrocleaning, the parts should only be given a cathodic treatment without sub-coppering; the bath should be formulated with sodium metasilicate, sodium cyanide, trisodium phosphate, and caustic soda. No more than three of the above salts should be present in the electrolytic bath. An electrolyte formulated on the basis of polymeric phosphates is better, especially when containing some phenol. It is worked at room temperature, 10-12 volts, for 20-30 seconds.

A thorough rinsing in cold flowing water follows cleaning. Next is a dip in a 2% hydrochloric or sulphuric acid solution or a hot 2% sodium cyanide solution. An acid dip in a 3-4% hydrofluoric acid solution has been found very advantageous.

Copper plating is best applied in a hot cyanide bath without current reversal. The copper plating bath should contain not more than 10-15 g/l free cyanide, operating at a temperature of 50-70°C. The current density is 2.5-4 amp./dm.^{2} and a minimum of 12-15 microns should be deposited. Copper coatings of up to 20-22 microns can be applied and these can be buffed. After thorough rinsing, neutralization in 3% sulphuric acid is followed by a rinse and nickel coating in a bright nickel bath. A minimum coating of 12-15 microns of nickel is sufficient.

A bright chromium bath with a high metal content is best with operating temperatures of 50-80°C. and current density of 20-30 amp./dm.^{2}. A somewhat longer-than- usual plating time is used. Pore and crack-free chroming are preferable.

Influence of Naphthalene Sulfonic Acids on Nickel Deposits Part 2: Bright Nickel Deposits

A. W. Pamfilow & O. E. Pantschuk: *Ukrain. Chim. Zhurnal* (Russia), **24**, No. 2, 266.

The authors gave details of comparative tests that were conducted on the reflectivity of nickel plated bright tin strips. The investigation was conducted to determine the effect of naphthalene mono-, di- and trisulfonic acids addition agents on cathode polarization.

Ten metal plates served as standards for visual testing of the coatings; the surfaces of this comparison scale ranged from dull mat unpolished to a highly polished surface. The influence of the naphthalene sulfonic acid additions was investigated with additions of between 0.1 and 6.0 g/l at temperatures of 25-55°S. The baths were operated at current densities from 0.5 to 2.0 amp./dm.^{2}. The pH of the bath was held constant at 5.8, and thickness of the nickel coating was 10 microns.

This work established that the high brilliance of the nickel deposit was caused by colloidal nickel sulfide. Best results were produced from baths containing the disulfonic acids, whose sulfo-groups are spaced in the molecule at the greatest possible distance from one another.

Investigation of the Structure and of the Magnetic Characteristics of Electroplated Deposits of Ferromagnetic Metals and Alloys in Relation to the Electrolysis Conditions; Part I: Nickel

J. M. Polukarow: *Zhurnal fiz. Chim.* (Russia), **32**, No. 5, 1008.

The investigation was concerned with the influence of current density, pH, temperature, stirring speed, superimposing alternating current, and addition of surface-reactive compounds on the magnetic characteristics of nickel deposits.

The coercive force and the internal stresses rise with increasing current density and with rising pH value, it was found. On the other hand, residual magnetism declines under these conditions. This is caused by the inclusion of hydroxides. The coercive force is associated in a linear manner with the internal stresses. With the addition of surface-reactive compounds to the bath, this relationship is destroyed, as the structure of the metal deposit changes. The occluded hydrogen is not the cause for the occurrence of internal stresses.

Bright Nickel Plating Baths — Additions

J. Mladenhoff: *Legkaja Promyslennost* (Russia), **8**, No. 3, 20.

Details are given of the results of investigations that were conducted on the action of brightening agents in nickel baths. The basic bath composition was as follows:

Nickel sulfate	200-220 g./l.
Boric acid	25-30 "
Sodium chloride	2-3 "
Sodium fluoride	3-5 "

To this electrolyte there were added 2-4 g./l. sodium naphthalene-disulfonate as the brightening agent and the bath was worked at:

Temperature	25-30°C.
pH	5.8-6.0
Current density	1-1.5 amp./dm.^{2}

The coating thicknesses obtainable are 8-10 microns within 30-40 minutes.

LEA

ABRASIVE FINISHING METHODS

COPPER PLATE

ELECTRODEPOSITED COPPER

Copper when electrodeposited in heavy films is most often used for protection of steel or zinc (die castings) against corrosion. Accordingly, the finish on the base metal is of secondary importance and frequently a fairly coarse polished surface is covered by a heavy deposit of copper of approximately .001" thick.

Generally, copper is used as an intermediate deposit to be followed by a nickel plate, which in turn is often followed by decorative chrome plate. If the final finish is a high color, the smooth, heavy copper deposit is **cut and color buffed with bar Grade 155 or ET60X LEAROK on a pocketed muslin buff at about 7000 sfm.** This may then be followed by a bright nickel plate and then directly to decorative chrome plating without further buffing. In other cases, the cut-down copper deposit is covered by a comparatively soft nickel deposit and the nickel **color buffed with bar 304-B or 309 LEAROK or lime finish on a loose muslin buff at about 7000 sfm.**

Where automated buffing is done liquid abrasive composition **LEA LIQUABRADE TH62M is recommended for heavy cut and color operation,** and **LEA LIQUABRADE SH33E for light cut and coloring.** Speeds of buffing wheels should be approximately 1000 sfm higher than those recommended for bar compositions.

This colored nickel surface produced with bar or liquid compositions is sufficient for a lustrous decorative chrome plate without further buffing.

When the final requirement is for a satin finish, the heavy copper deposit is first satin finished with either **"C" or "B" LEA COMPOUND on a loose muslin buff at about 5000 sfm.** The nickel is then deposited and, depending upon the thickness of the nickel deposit, a **medium or fine grade of LEA COMPOUND is used for satin finishing** the nickel surface. For a fairly heavy nickel deposit **Grade "C" LEA COMPOUND** is used on a **loose muslin buff at about 4500 sfm,** care being taken so that the lines from this operation are parallel to those produced on the copper plate beneath. With a thin nickel deposit, **Grade "R" or Grade "F" LEA COMPOUND** should be used instead on a **soft, packed muslin buff at about 4000 sfm,** again in the same direction as the satin finishing operation on the copper. Decorative chrome plate is then deposited on top of the satin nickel surface and if this is done properly, no further finishing is required. If the chrome bath is not functioning properly and the chrome deposit is foggy or milky, a light satin finishing operation is done on the chrome plate with **Grade "FG" LEA COMPOUND on a soft, packed muslin buff at about 3000 sfm.** Once again, the satin finishing operation should be done in the same direction as the previous ones.

Tailored cyanide copper processes

...there's a specific Lea-Ronal copper process to meet your own exacting requirements

Over the years Lea-Ronal has gained world-wide recognition for its research on cyanide copper plating. From this research and development have come numerous processes, each with its own characteristics that make it outstanding for a specific type of operation. Every member of this Lea-Ronal family of Cyanide Copper Processes has been thoroughly production-tested and has been instrumental in improving the quality and production of the user's plating operation.

Any order for a Lea-Ronal Process carries with it plus values in experienced technical service and know-how.

for bright high speed copper

COPPER-GLO

For plating buffed zinc die castings or steel where maximum leveling or hiding is not a factor.

A full bright high speed cyanide copper that has become the industry standard. Through continued research this process has been constantly improved to give trouble free bright high speed operation.

for buffable copper

CUPRALL

A lustrous, ductile, buffable copper than can be plated at high speeds. Because of these characteristics and its exceptional tolerance to impurities, this bath has become the standard for such operations as bumper refinishing.

for hiding imperfections

Q-STRIKE

A cyanide copper strike developed to aid in "hiding" surface imperfections that are not covered by conventional strikes or bright copper processes. Will increase hiding and leveling when used as a strike prior to bright nickel.

for micro-leveling and lustre

Q-LEVEL

A new improved economical and simple cyanide copper process that offers a definite degree of leveling or hiding without employing current reversal cycles. Imperfections in castings can be partially or completely hidden (Leveling is achieved on surface roughness not exceeding 10 RMS).

for high rates of deposition plus micro-leveling

AIR-Q-LEVEL

A Q-Level Bath specifically designed for air agitation. Offers all the advantages of the Q-Level Process plus increased rates of deposition, and excellent metal distribution.

for leveling plus high rates of deposition

PR-Q-LEVEL

A Q-Level Bath designed to operate with Periodic Reverse. In addition to the high rates of deposition, macro-leveling as well as micro-leveling can be achieved. Process is simple, economical, completely stable with no deterioration of brighteners over prolonged operating periods.

The LEA GROUP
serving the Finishing Field
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The Lea Mfg. Co., Waterbury, Conn.
Lea Mfg. Co., of Canada, Ltd.
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THROUGH WHOM THESE CYANIDE COPPER PROCESSES ARE EXCLUSIVELY MARKETED.

Note: The above Lea-Ronal Cyanide Copper Processes are covered by patents or pending patents.

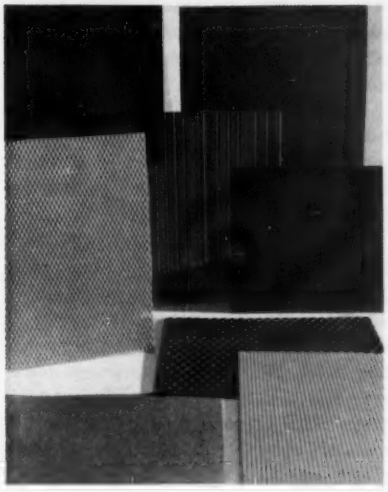
Are you interested in Buffing, Polishing and Burring Specialties? **SEE OTHER SIDE OF THIS INSERT.**

Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT FOR THE METAL FINISHING INDUSTRIES

Spray Finishes for Metals

Metal & Thermit Corp., Dept. MF, 100 Park Ave., New York, N. Y.



A new system makes possible application of vinyl dispersion coatings to plain or textured metal, steel or aluminum, after it has been fabricated, resulting in worthwhile savings over previously used methods which start with pre-laminated or pre-coated metal sheet.

The following advantages are claimed for spray-applied vinyl dispersion finishes:

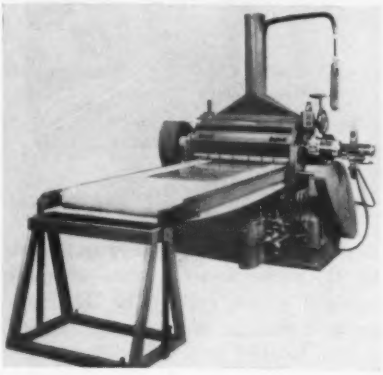
1. Applied to the finished part, therefore requiring no special care in handling metal during fabrication. Faster production possible.
2. Finish applied in the fabricator's own shop using standard spray equipment (also electrostatic spray).
3. Rejects can be stripped of their vinyl finish chemically and then resprayed.
4. Welding and forming operations are done prior to coating.
5. Finish can be sprayed on complex shapes and castings, as well as flat surfaces.
6. No raw or unfinished edges.
7. To change color, merely change the vinyl spray material. No unnecessary investment in inventory.
8. Scrap metal is uncoated, keeping up its value. Waste of vinyl is eliminated.

Surface Finishing Machine

Clair Mfg. Co., Dept. MF, Olean, N. Y.

This new "one-pass" model weighs upwards of 5,000 lbs. It measures 7′ 5″ wide by 5′ 7″ deep, and is 5′ 2″ high. Its flexible pinch-roll feed will handle material up to 2″ thick and infinitely variable linear rate of feed within a wide range.

The spindle or back-up roll can be changed in approximately two minutes. The position of the synchronized back-up roll is adjustable in two directions. Model No. 309 will accommodate different types of back-up rolls, automatic liquid compound applicators and synchronized power take-offs to drive conveyors. The auxiliary discharge pinch-roll assembly is removable. In all, 27



optional features or modifications are available.

Special safety features have been incorporated in the machine. The low voltage automatic control circuits embrace eight features designed to function as positive safety guards against physical hazards, entry of foreign material, jammed work and other emergencies. These features are supplemented by three independent manual means of de-energizing the safety circuits to stop the machine.

Supplementary stations, integrally controlled by Master Model #309 are available for installation front or rear — top or bottom coverage of the work to be done.

Cleaning/Burnishing Compound

Frederick Gumm Chem. Co., Dept. MF, 538 Forest St., Kearny, N. J.

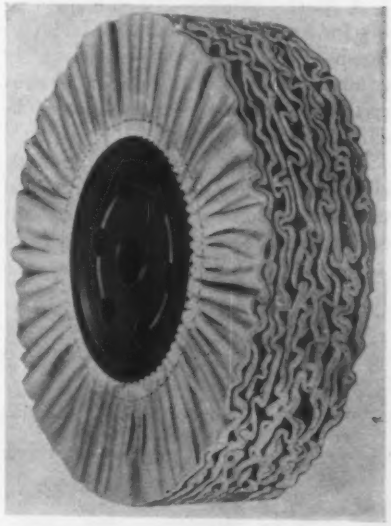
Self-tumbling steel, brass or copper parts can now be prepared for barrel plating by a simple process built around a new combination cleaning-burnishing compound, Clepo 12-K.

Supplied as a white, dust-free granular compound, it is added to water, the work loaded in an oblique barrel and the charge allowed to tumble for 5-30 minutes. This operation cleans and burnishes in one operation and, after rinsing with clean water, produces parts which are free of waterbreaks, lightly deburred, and also burnished. These parts require only an acid dip and rinse prior to plating.

Treated Buff

Schaffner Mfg. Co., Inc., Dept. MF, Schaffner Center, Emsworth, Pgh. 2, Pa.

The new "Amber Extra Life Buff" is produced with a treatment that insures longer buffing life under the most severe conditions. It was particularly developed for surfaces that need severe buffing and have a tendency to wear buffs down quickly. The finish attained



is stated to be smooth and scratch free. The buff is recommended for both ferrous and non-ferrous metals.

Addition Agent for Cyanide Baths

Kosmos Electro-Finishing Research, Inc., Dept. MF, 140 Liberty St., Hackensack, N. J.

Booster Brite for cyanide plating solutions, zinc, cadmium, copper and brass is claimed to enhance throwing power. It produces a foam blanket on zinc cyanide solutions, suppressing noxious fumes due to plating, and combines with organic brighteners to keep them in solution rather than precipitating as sludge. Only ½ oz. is required per 100 gal. of plating solution.

Emulsion Cleaner

Heatbath Corp., Dept. MF, Springfield 1, Mass.

Emulsion Cleaner #1 is an emulsifiable solvent-type cleaner used to remove solid dirt and heavy oil and dirt contamination and is not harmful when dragged into alkali cleaners, it is claimed.

The cleaner is used as received. The work to be cleaned is immersed and allowed to remain from several seconds to 10 minutes. Pressure spray and/or running water rinses are used after draining to give a rapid dispersing action as the cleaner emulsifies, thus removing the oil films and solid dirt present. With good rinsing, many processes require no further cleaning.

Quick-Disconnect Terminal for Brushes

National Carbon Co. Dept. MF, 30 E. 42nd St., New York 17, N. Y.

A quick-disconnect terminal assembly for brushes is designed to facilitate brush replacement on electric utility equipment, and on any motor or generator in which the brushes are difficult to reach.

The assembly consists of a stationary clip, easily bolted to the machine, into which either one or two terminals can easily be snapped. All parts are silver-

plated beryllium copper for minimum resistance.

Water Wash Spray Booth Purgant

DuBois Chemicals, Inc., Dept. MF, Broadway at Seventh, Cincinnati 2, O.

Perj, believed to be the first of its kind of purging water curtain paint spray booths, helps to eliminate the unpleasant experience of costly, time-consuming shut-downs due to clogged nozzles, dirty hydraulic system in the booth, bound pumps, etc. When used periodically, it is claimed to reduce clean-up time measurably. The product contains no corrosive solvents, and is safe on ferrous and cuprous metals.

Plating Thickness Gauge

Dyna-Empire, Inc., Dept. MF, 1075 Stewart Ave., Garden City, N. Y.

Model D-873 Plategage is an instrument capable of precision measurements of plating or coating thickness from 0.0001 to 0.015". It is stated to

provide fast and accurate direct reading thickness measurements of these deposits: silver, copper, nickel, chromium, cadmium, zinc, brass, tin, etc. on iron or steel base materials.

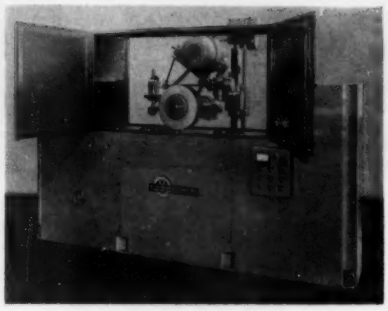
A specially designed magnetic probe, with its geometrically described tips, permits precision measurements to be made on flat or irregularly contoured surfaces and large areas. On contours the gauge can measure as low as $\frac{1}{16}$" OD or ½" ID.

The instrument weighs only 9 lbs., is completely transistorized for use on line or self-contained batteries, and comes complete with its own universal measuring probe and two thickness calibration standards.

Polishing Process Tester

Acme Mfg. Co., Dept. MF, 1400 E. Nine Mile Road, Detroit 20, Mich.

A new finishing process testing machine is designed to enable manufacturers of buffs, compounds and basis



metals as well as metalworking finishing plants and departments to study and evaluate finishing process variables.

The machine consists of a cabinet base that houses the mechanism for moving sample materials and a standard G-1 adjustable lathe on which the buffing wheel is mounted.

The part samples are mounted by toggle clamps or magnetic means on 5-in. by 12-in. platens spaced 40-in. apart on an over-and-under conveyor arrangement. As each platen passes under the buffing wheel, the wheel pressure is accurately measured by a beam scale. The conveyor is driven by a motor through a variable speed drive that provides traverse speeds of from 10 to 30 feet per minute.

Buffing wheel speeds are adjustable from 700 to 2,100-rpm. Wheels from 6 to 20-in. diameter can be mounted on the lathe spindle which can be of a stroking type if desired. Wheel pressure of up to 50-lb. can be preset by a spring or air cylinder wheel loading arrangement.

Exhaust fans at each side of the rear of the base cabinet keep the finishing area of the machine free of buffing dust. The amount of horsepower drawn by the motor driving the buffing wheel is indicated by an instrument on the front of the machine.

With the machine it is thus possible to have the following conditions varied for tests: sample feed, buffing pressure and buffing wheel speed. Readings of motor horsepower plus a study of the resulting finish provide a means of evaluating the variables in process speeds and pressures as well as differences in wheels and compounds.

The machine can provide an excellent method of evaluating the finishing qualities of different materials by subjecting each of them to the same set of process conditions. A variety of testing machine arrangements can be built to suit specific requirements.

The finishing process testing machine occupies a floor space approxi-

mately 10-feet by 5-feet and is about 7-feet high overall.

Zinc Purifier and Brightener

Kosmos Electro-Finishing Research, Inc., Dept. MF, 140 Liberty St., Hackensack, N. J.

Zin-K-Pure is stated to purify and brighten zinc baths with very little extra addition of organic or inorganic brighteners. It is excellent for subsequent chromate treatment or bright dipping. Cost is only a few cents per day to maintain a 1,000 gal. bath in good condition.

Airless Paint Spray Gun

Spraying Systems Co., Dept. MF, 3245 Randolph St., Bellwood, Ill.

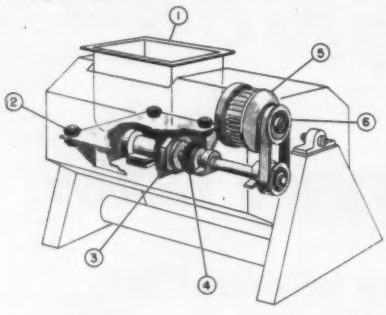
Identified as the No. 8395-22HPSSTC Gun Jet, this new spray gun is built with a high-volume inlet and outlet, so that liquids can keep recirculating through the system both while the gun is being used and during shut-off periods. Design includes highly abrasion resistant tungsten carbide valve seat and needle, stainless steel body and cap and Teflon packings. The valve seat is positioned directly behind the orifice tip and the valve needle, in passing through the valve seat, automatically cleans the valve.

The inlet body is totally independent of the valve trigger mechanism. Liquids are in contact only with the body, valve needle, valve seat and orifice tip. Thus the spray head outlet of the gun can be completely and easily cleaned, and the trigger control mechanism is never contaminated by liquids.

The overall unit is extremely light in weight and easy to handle. High-leverage trigger action provides finger touch control without hand fatigue at any line pressure up to the 2,000 psi maximum of the gun.

Vibratory Finishing Equipment

Pangborn Corp., Dept. MF, Hagerstown, Md.



A complete line of vibratory finishing equipment centers about an air-cushioned, vibratory finishing machine, distinguished by a suspension system long used successfully on buses and trucks. Designed to replace and extend the application of tumbling and precision barrel finishing, the new machine embodies simple, rugged and compact design features, with convenient and positive methods for controlling both frequency and amplitude of the vibratory work load.

Vibration is generated by a short heavy-duty eccentric shaft mounted with minimum spacing between support bearings for maximum rigidity. Weights may be added or removed from the eccentric to change the vibratory amplitude. There are no cams, cranks or other fast-wearing mechanical linkage. Connecting the eccentric with the stationary jack shaft is a flexible annular-type "doughnut" molded-rubber coupling designed to completely absorb shaft misalignment during vibration. Variable-pitch sheaves of the belt drive wheel are adjustable to provide vibratory frequency control within a 2:1 ratio. This allows any speed setting within this range as for example between 1000 and 2000 rpm. Optional equipment is available to provide infinite and automatic speed control where required.

The machines come in 1½, 3, 6, 12 and 18 cubic feet sizes, with larger models soon available. The new line also includes accessories, auxiliary equipment and a full range of media and compounds.

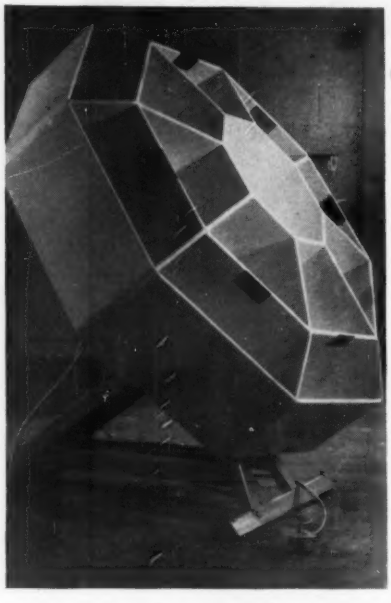
Cyanide Plating Bath Additive

A-Chem Supply Co., Dept. MF, 4463 W. Lawrence Ave., Chicago 30, Ill.

Satintone is a material designed for use in copper cyanide, brass and bronze still and barrel operations. In barrels the deposits are claimed to be bright and uniform in color, fine-grained, and in barrel and still tanks the well-known tarnishing formation appears to be eliminated. The liquid addition agent is added in the amount of 2% by volume. Standard baths respond uniformly to the addition of this material, plus offering an excellent buffing surface for copper. Copper deposits are uniform in color, semi-bright with excellent throwing power in the low current areas. The product is claimed to eliminate the need for metallic brighteners and wetting agents to overcome pitting conditions in high efficiency baths.

Drying Machine

Hannon & Smith Co., Inc., Dept. MF, 9 Schoon Ave., Hawthorne, N. J.



The Smitty drier is said to remove solvents in ten to sixty seconds from machined, electroplated, soldered, or stamped parts and assemblies. The machine dries parts quickly, cleanly, and inexpensively, leaving no stains.

According to the manufacturer, this machine is instantly ready to go to work with an on/off foot switch. It requires very little in the way of maintenance and up-keep.

Aluminum Treatments

Mitchell-Bradford Chem. Co., Dept. MF, Wampus Lane, Milford, Conn.

Aluminum Etch #22 is a free-flowing salt mixture which, when used at recommended concentrations and temperatures in water solutions will clean and chemically etch aluminum and aluminum alloys. It will clean and produce either a fine or deep etch, depending upon the concentrations, time and temperatures used.

This etching compound will not cause scale or scale build on tanks, it is claimed, and can be rinsed very easily when it is necessary to dump the solution and make up a new one. The solution is economical because of long life at low concentrations and rapid etching. There is also low drag-out and it operates at a fairly wide range of temperatures and concentrations.

Al-Smut Remover is a chemical salt mixture which will remove smut from most types of aluminum. It will also deoxidize and brighten aluminum and, because it is a dry powder, eliminates the use of hazardous liquids and carboys. Four to eight ounces are used per gallon of water, at room temperature.

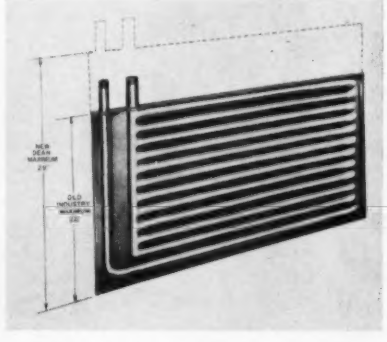
Cleaner #20 is a non-etching aluminum cleaner, which is the result of compounding the latest developments in dispersants, wetting agents, emulsifiers and high quality alkalies. It is formulated with a maximum of active and inactive sodium oxide content for aluminum cleaning, adequately buffered to insure high activity and long life, but also sufficiently inhibited to insure against etching.

The product has excellent detergent qualities, penetrating action, and will rinse easily and thoroughly from work being cleaned. It can be used at concentrations of six to eight ounces per gallon of water, and operated at 160°-190°F.

Wide Plate Coils

Dean Products, Inc., Dept. MF, 1048 Dean St., Brooklyn 38, N. Y.

The above manufacturer now offers



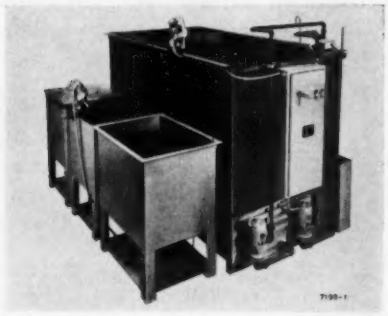
Panelcoils in five standard widths, ranging from 12″ to 29″. All five standard widths can be made to exact length requirements up to 143″.

New 29″ width is claimed to be a

full seven inches wider than the previous industry maximum, which makes it possible in many cases to reduce the actual number of coils required for a given heating or cooling job.

Chromium Waste Treatment Unit

George L. Nankervis Co., Dept. MF, 15300 Fullerton Ave., Detroit 27, Mich.



A package unit for treating plating room chromium wastes includes all the necessary tanks, pumps, mixers, and controls to effectively treat up to 600 gallons of chromium wastes per hour.

The new unit, designated as the Chromator Model 3340, collects chromium rinse water in a sump and then pumps this into an eight compartment mixing, reaction, and settling tank. Here sodium metabisulphate, sulphuric acid, and caustic are automatically metered into the waste to reduce the hexavalent chrome to trivalent and to regulate the pH to between 7 and 8. Reduction of the hexavalent chrome is to less than one part in one million.

The unit is easily installed and requires no changes in floors, drains, or other structures. All motors, pumps, and controls are prewired, ready for operation on 220/440, 3 phase power. Operation is entirely automatic and continuous. No operator is required. Wastes treated can be safely dumped directly into municipal sewer systems or streams.

Portable pH Meter

Analytical Measurements, Inc., Dept. MF, 585 Main St., Chatham, N. J.

Easily portable, (it weighs but 5 lbs.) Model 700 pH Meter can be used wherever a standard 115 volt AC outlet is available. This instrument is the first of its kind to provide a truly big scale, it is claimed, so that it may be read quickly and easily, and a compact housing.

The meter features a single operating control and a high output electron-

ically modulated amplifier, with printed circuitry and sensitive meter combination. The originally designed polyethylene electrode probe unit permits the user to "bring the meter to the sample — not the sample to the meter." This fact greatly enhances the versatility and usefulness of this instrument, since it may be used to make pH readings anywhere on the production line and not confined to the laboratory.

Precision Agitator

Spraymation, Inc., Dept. MF, 25 Amity St., Little Falls, N. J.

Mini-Mix is a miniature precision agitator designed specifically for those hard to do mixing jobs too small for the standard mixer. It can keep up to a half gallon of critical solution properly mixed, according to the manufacturer, or keep acrylics correctly mixed in touch-up guns to ensure color match and, in the paint laboratory, it ensures repetition of test batches.

The product is used for special applications where space is limited or weight is a problem, and positive agitation is necessary.

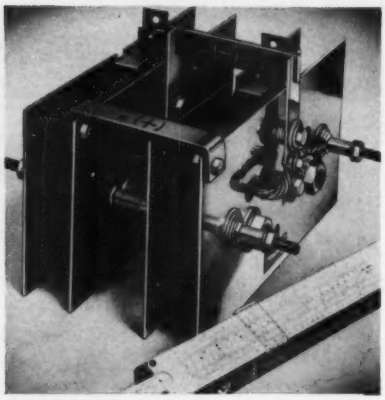
The agitator is made of all non-corrosive parts, with stainless steel shafts and two sealed ball bearings. It has variable speed, is explosion proof, cannot burn out and is unconditionally guaranteed.

Silicon Rectifier Stack

International Rectifier Corp., Dept. MF, 1521 E. Grand Ave., El Segundo, Calif.

Pre-engineered high power silicon rectifier stacks incorporating built-in paralleling reactors to insure equal current distribution through parallel circuit branches feature ratings up to 750 amperes, with from 50 to 600 volts peak reverse voltage ratings.

A standard "building block" is a



2-1-2-D "doubler" module with integral paralleling reactor, and four 70 amp. rated silicon junction rectifiers mounted on copper cooling fins. Two of these modules may be mounted to form a single phase bridge (as shown in photo) rated up to 550 amperes rectified d.c. output (when operating within recommended temperature and cooling limits).

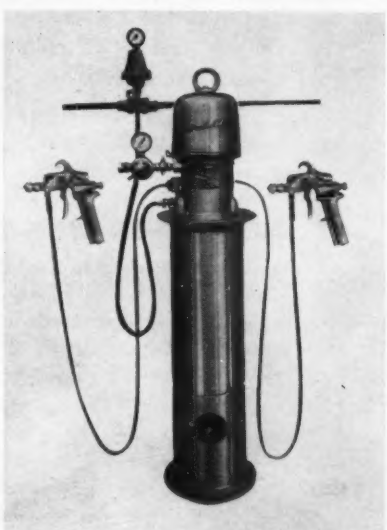
Three of these basic modules will form a 3-phase bridge rated to 750 amperes. Other configurations include "Scott 4-phase bridges," and 6-phase bridges in both series and parallel connections and proportional ratings.

Airless Spraying Unit

Gray Co., Inc., Dept. MF, 1037 Sibley St. N.E., Minneapolis 13, Minn.

A new airless spraying unit that connects right to existing circulating paint systems to permit central paint viscosity control of all spray outlets, the Standpipe Hydra-Spray eliminates virtually all overspray and bounce-back at remote spray areas while providing complete, uniform coverage over rough or porous surfaces, and maintaining high-speed application, it is claimed.

Paint is kept circulating and only drawn into the unit as it is used. Sealed standpipe allows pumping assembly to operate immersed in solvent. Unit occupies less than one foot of floor space.



Portable Belt Sander

Nu-Matic Grinders, Inc., Dept. MF, 8224 Carnegie Ave., Cleveland 3, Ohio.

A new portable abrasive belt unit for operations requiring slack of belt, contact wheel or platen is air-powered unit and uses a 1″ by 36″ abrasive belt. Belt change is quick and tracking is simple. The air motor is approximately 1 h.p. at 6000 rpm. Belt speed is 4500 s.f.p.m.

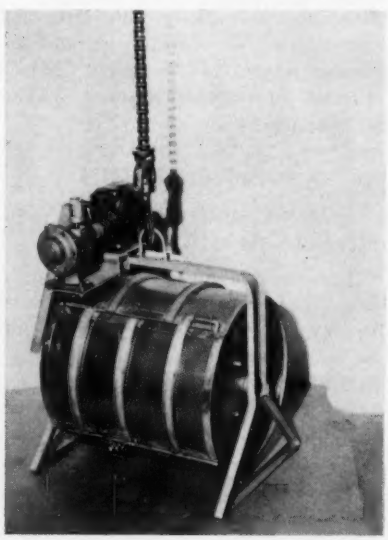
The new unit may be hand-held or bench-mounted. It is designed for heavy stock removal as well as polishing and blending. It can be used on all materials including ferrous and non-ferrous metals.

Rotating Power Tumbler

Dayton Rogers Mfg. Co., Dept. MF, 2824 - 13th Ave. South, Minneapolis 7, Minn.

A new, improved, portable, rotating, power tumbler for all metal cleaning applications consists of a rotating drum, air motor driven, with speeds from 2 to 12 rpm.

Parts can be dropped into the drum through the large hinge door, which is secured by two spring-loaded locks. Savings in solvent loss alone will quickly pay for the unit, it is stated. It is constructed of materials to withstand high temperatures for immersing the unit in practically any high or



low temperature solutions. The power tumbler is now made in three sizes: 11", 15" and 18" drum diameters. The unit comes completely equipped, ready to run, and is adapted for hook lifting.

Sand Blasting Gun

The ALC Co., Dept. MF, Rt. #5, Box 40, Medina, Ohio.

The new Model B Sandy Jet gun can be equipped with any of three available nozzles, each designed to meet the requirements of a variety of jobs, from the smallest to the largest. This new design further permits the use of most sand blasting abrasives, such as, silica, or any hard sand, nut shells, metal shot, or aluminum oxide in the treatment of plastic, metal, glass, wood or stone surfaces.

The unit is fully guaranteed, according to the manufacturer, and each is delivered on a 10-day money-back guarantee. Included with each unit is an operator's hood, a face shield that can be swung to the top of the head without removing it, two extra nozzles, an extra air jet and an Allen wrench.

Two-Color Graining Machine

Union Tool Corp., Dept. MF, Warsaw, Ind.

A new definite register two-color graining machine, the Uni-Grainer, is designed to give true-to-life reproductions of the most beautiful wood grains on sheets, tops, fronts, panels and other products. It is quickly set up, easily operated and cleaned fast.

Among other features claimed are: Printing assembly easily raised or lowered for thickness adjustment — no change in conveyor pass line height. Cylinder designed for fast removal through split housings and roller bearings. All rolls mounted in roller bearings. All excess ink reclaimed. Washer rolls for cleaning the cylinder may be added if desired. Massive fabricated

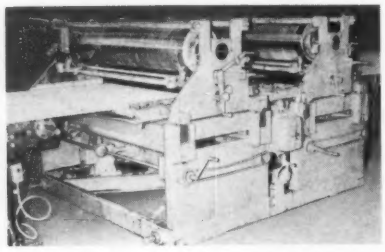


plate steel construction insures rigidity needed in any printing operation.

The grainer is ideally suited to automation. It is precision, high production equipment. Models are available for 36″, 48″, 60″ width material. Feed speed is variable.

Small Size Star Filter

Micro Metallic Div., Pall Corp., Dept. MF, 30 Sea Cliff Ave., Glen Cove, N. Y.

High flow, large cake capacity and small size are features of the new Star S-78 porous stainless steel filter element. The filter is contained in a housing only 4 inches in diameter. It is available in lengths from 6 to 18 inches. Filtration ratings down to 2 microns are available. The unit is suitable for operating pressures from full vacuum to 125 psig and operating temperatures up to 300°F. The very large surface area per unit volume permits high flow rates and low pressure

drops; the 6 inch unit, for instance, can be used for flow rates up to 5 gpm or 60 cfm at pressure drops of only 2 to 3 psi.

All stainless steel construction is used in both the filter and its housing. An additional feature of the housing is the quick-opening construction. Designed to prevent contaminant from going downstream of the filter, the housing and element are removed downward when the filter is cleaned; this keeps the slurry within the lower portion of the housing.

Compressed Air Dryer

General-Erie, Dept. MF, 1702 Peninsula Drive, Erie, Pa.

The new two-stage (non-regenerative) general air dryer for compressed air systems, combines both mechanical and chemical methods for removal of all water and moisture vapors, providing a dewpoint as low as minus 20°F. The first stage utilizes a helical centrifugal chamber as a pre-filter for the air stream, where all water and other particle contaminants are removed, leaving only the vapor content entering the desiccant (chemical) bed. This reduces the desiccant consumption.

The unique desiccant, called General Beads, is a polychemical base in small bead form and slowly dissolves during the process, requiring additions only twice yearly. They are never removed or heat treated in any way. The dryer is comparable to most high cost dryers, suitable for all industrial applications at a low price.

They are available in 12 standard models, ranging up to 2250 cu. ft. free air per min. capacities. Standard working pressures are 150 and 200 psi.

Higher pressures, and greater capacities are also available.

Alkaline Deruster

Cowles Chem. Co., Dept. MF, 7016 Euclid Ave., Cleveland 3, Ohio.

A new derusting compound for alkaline plating lines, known as Rustnix, is being packaged as individually boxed 50 pound blocks for convenient handling and storage. The block, porous for rapid solubility, is contained in an inner wrapper of polyethylene so it can be handled without gloves. After slitting, it may be dropped into the bath whole, wrapper and all. The compound will disperse into solution by its own action, without stirring. After dissolving is completed, the wrapper is removed from the tank.

The product sequesters rust without attacking metal, providing the additional advantage of producing smut free surfaces.

Ultrasonic Cleaner

National Ultrasonic Corp., Dept. MF, 111 Montgomery Ave., Irvington 11, N. J.

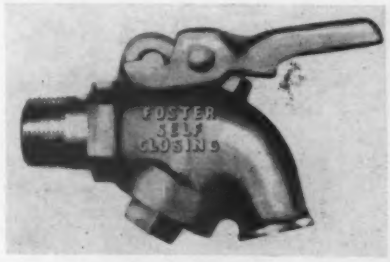
Model 160 Standardline features a 13-gallon tank made of heavy gauge polished stainless steel. The tank is 20 inches in length, 16 inches wide and 10 inches deep. The tank has deep drawn rounded corners to facilitate the rinsing out of contaminants removed by ultrasonic energy. 30% of the tank bottom is covered with crystals. Actual radiating surface is 96 square inches.

The 115-volt AC single phase 60 cycle generator, designed for continuous operation, delivers an average power output of 500 watts and produces peaks of 2000 watts. Features include one-tube oscillator, front panel switching which permits a choice of either of two transducers, forced air cooling and 3-wire ground protection. The unit, which can be adjusted to available line voltage, is interlocked for operator safety.

Drum Faucet

Foster Aluminum Alloy Products Corp., Dept. MF, Forestville, N. Y.

A cast aluminum, self-closing, lockable, gasket-type drum faucet has been developed which will not leak with any chlorinated solvent except methylene chloride and chloroform, according to the manufacturer. The internal spring is made of stainless steel to avoid rusting and clogging.



The faucet is claimed to be less costly than ground seat units, faster to use than screw cocks, and will outlast die-cast zinc faucets many times. It is equipped with a red handle to identify its specific use for chlorinated solvents only, since the gasket material is soluble in water.

BUSINESS ITEMS

Farmer New Stevens Representative

Bernard A. Farmer

Bernard A. Farmer has been appointed by *Frederic B. Stevens, Inc.* as sales representative in the New York City area, New Jersey and parts of Pennsylvania.

Mr. Farmer joined the firm with several years of sales and service experience in the metal finishing industry. His home is at 8114 Fifth Ave., No. Bergen, N. J.

Koehler Promoted at H-VW-M

Hanson-Van Winkle-Munning Co. has announced the appointment of *Henry B. Koehler* as manager of electrical sales.

Henry B. Koehler

Prior to joining H-VW-M he was with the Public Service Electric and Gas Co. for eight years, serving as a power representative in the company's New Jersey territory. During this period he was primarily concerned with selling power to industrial installations. He has been with the company since November, 1956.

Mr. Koehler is a graduate of Rutgers University, where he received his electrical engineering degree in 1948. He is an active member of the American Electroplaters' Society, American Institute of Electrical Engineers, and he is Chairman of the Electroplating Rectifier Section of the National Electrical Manufacturers Association.

Schore to Distribute for Baker Brothers

Baker Brothers Co., Inc. of Canton, Mass., rebuilder of used equipment and accessories, announces the appointment of *George Schore Associates, Inc.*, Westbury, N. Y., as exclusive distributor of its equipment in the metropolitan New York area. This will mean prompter service for the firm's full line including sale of automatic plating and polishing equipment in this area.

Mr. Schore has had wide and varied experience as both technical and service engineer for the metal finishing industry. He can be reached at LIggett 4-6000.

Michigan Chrome Transfers Neeme

Al Neeme, district sales manager for *Michigan Chrome and Chem. Co.*, has been transferred to the Ohio, Kentucky area. He previously directed company sales on the West Coast.

Mr. Neeme has been with the company for many years and has had long and extensive experience in all phases of company operations. He served first as representative for electroplating sales and then for coating sales. On the West Coast he acted as chemical sales representative until his promotion to district sales manager in 1959.

In his new post, Mr. Neeme will headquarter at Dayton, Ohio and will direct technical sales to company accounts in the appliance, electroplating, and plastic coating industries.

Sel-Rex Establishes Offices in Atlanta

The establishment of new offices at 1000 Peachtree St., Atlanta, Georgia, is announced by *Sel-Rex Corporation*, Nutley, N. J.

Robert H. Probert, most recently representative for Wyandotte Chemicals, has been assigned to the new office as sales engineer, and will cover North and South Carolina, Georgia, Alabama, Florida, and the eastern portion of Tennessee.

A graduate of Georgia Tech, Mr. Probert was associated with Atlanta Plating Works for nearly ten years, latterly as shop manager. An active member of the A.E.S., Mr. Probert has served on various committees with the South Florida, Carolina and Virginia branches, and was secretary of the Blue Ridge Branch for one year, as well as secretary of the Atlanta Branch for 3 years.

Robert H. Probert

Mr. Probert has undergone an intensive period of technical training at the firm's Nutley laboratories. This, plus his own 'shirt sleeve' background, qualifies Mr. Probert to supply technical service to customers and prospects in the Southern area.

Wyandotte Adds Reddy to Boston Staff

Industrial representative *Paul F. Reddy* is a recent addition to the Boston District staff of *Wyandotte Chemicals'* J. B. Ford Division. Industrial firms in the Rhode Island-Southeastern

Paul F. Reddy

Massachusetts area will find his thorough knowledge of paint spray booth maintenance, electroplating methods, vehicle cleaning and solvent emulsion cleaners valuable in servicing their shop requirements.

Mr. Reddy's ten-year record of service to the industry includes metal cleaner recommendations, conducting shop test runs and demonstrations of various metal cleaners applications.

Mr. Reddy is a member of the American Electroplaters' Society, the American Chemical Society, and holds a degree in chemistry from Boston College.

American Metal Climax Consolidates Offices

American Metal Climax, Inc. announces the consolidation of its New York corporate and division offices, now located in the American Metal Climax Bldg., 1270 Ave. of the Americas, New York 20, N. Y.

Stutz Names New Executive

Stutz Company, manufacturers and suppliers of electrochemical and metal finishing equipment and supplies, Chicago, Ill., announce the addition of *Roy A. Hoegh* to the executive staff. He will serve as manager of the Plating Barrel Division of the company, and will also serve as special assistant to *George Stutz*, board chairman.

Mr. Hoegh brings a wealth of experience to the company, having served for the past 10 years with the Mercil Plating Equip. Co. For 8 of the 10 years he served as general manager. Prior to his position with Mercil, Mr. Hoegh was an industrial engineer for a brick press company.

Roy A. Hoegh

Mr. Hoegh is a graduate of Northwestern University with B.S. degrees in Mechanical and in Industrial Engineering.

Weisberg and Kroll Form Eltex Research Corp.

Mark Weisberg and *Harry Kroll* have joined forces to act as consultants in the fields of organic synthesis, chelation chemistry, pharmaceuticals, dyestuffs, organic intermediates, surface active agents, resins, polymers, metal finishes, corrosion inhibition, textile chemical specialties.

Mr. Weisberg, a Tufts University graduate, has been active in the chemical industry for 40 years. He was the founder and owner of Alrose Chem. Co. which he sold to Geigy Chem. Corp. In 1954 he organized a consulting business, Eltex Chem. Corp., with offices and laboratories at 41-45 Seekonk St., Providence, R. I. He is the founder of Technic, Inc., Providence, suppliers of soluble precious metals for electroplating. He also was instrumental in the founding of Wymat Chem. Corp., Kearny, N. J., and Hampshire Chem. Corp., Nashua, N. H.

Dr. Kroll, who received his Ph.D. from the University of Chicago in 1942, was a research director for Alrose Chem. Co. and for Geigy Chem. Corp. after they acquired Alrose, and was section chief of the Physical Chemistry Section at Olin Mathieson Co. For the past three years he has been a consultant to many industrial com-

panies and doing special research work under contract to the Atomic Energy Commission and the National Institute of Health. He is the author of numerous papers on chelation, corrosion inhibition, pharmaceuticals.

Both men hold many patents on organic chemicals and metal finishing.

Mr. Weisberg and Dr. Kroll will operate under the name of *Eltex Research Corp.*, at the 41-45 Seekonk Street, Providence, R. I., address.

Redmond Transferred by E. F. Houghton & Co.

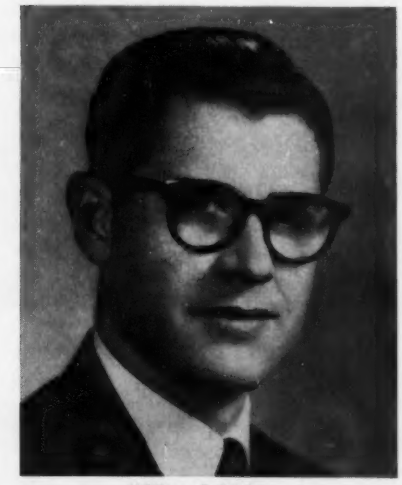
John J. Redmond has been transferred to the Steel Mill Division of *E. F. Houghton & Co.*, Philadelphia, Pa. in sales and service work on rolling oils, cleaners and rust preventives used in strip mill production. Mr. Redmond was formerly in metal working sales in the Canton-Youngstown area.

Kocour Manufacturing Greaseless Compounds

Kocour Co., of Chicago, Ill., recently completed a new installation for the manufacture of Roberts greaseless compounds in Chicago under license from the *Roberts Rouge Co.* By manufacturing the line in Chicago, the economies of local production and the advantages of controlled inventory, fresh stock and immediate delivery will benefit the Midwestern, Western and Central Southern consumer. The installation is now in full production.

Lea-Michigan Appoints Millman

William G. Millman has been appointed assistant technical service manager of the Electrochemical Division of *Lea-Michigan, Inc.*, Detroit, Mich.



William G. Millman

Mr. Millman will be responsible for technical service in connection with bright and high speed electroplating processes.

DuBois Opens New Laboratories

The new laboratories of *The DuBois Co.* just opening at 634 Broadway, Cincinnati, Ohio, occupy the entire top floor of the building, providing scientifically ideal and environmentally attractive and convenient study and research conditions for staff personnel.

Centered about the technical library and conference area, the department includes completely separate work quarters. Equipment includes not only customary chemical laboratory items, but also both prototype and pilot working models, as well as standard commercial machines in some cases, in the fields of spray painting, phosphating, barrel finishing, and mechanical dishwashing.

Laboratories at branch plants in New Jersey, Texas, and California will continue their present activities, with gradual expansion at all points to take care of the continuously enlarging service to institutions and industry.

Nordson Elects Daly Vice-President

Nordson Corporation, Amherst, Ohio manufacturers of airless spray painting equipment, has announced the election of *Kenneth Daly* as vice-president. Daly

Kenneth Daly

was formerly general manager of the Western Automatic Screw Co. of Elyria and vice-president of its parent organization, the Standard Screw Co.

Circo Names Fischell to Head Production

Norman Fischell has been appointed vice-president in charge of production by the *Circo Equipment Co.*, Clark, N. J., manufacturer of steam cleaning and ultrasonic cleaning equipment. His primary responsibility will be the direction of engineering, design, development and diversification activities, as well as production, production control and inventory control. Fischell will also carry on liaison between the plant and the sales department, with particular emphasis on field engineering problems.

Norman Fischell

Fischell's past experience includes the post of chief engineer of the Container Division of Jones and Laughlin Steel Co., plant engineer of the Container Division of the Inland Steel Corp., and development engineer in the Engineering and Research Division of the Celanese Corp.

He graduated cum laude from the City College of New York in 1948, and took his master's degree in industrial engineering from Columbia University. He is currently a member of the Tau Beta Pi and Pi Tau Sigma fraternities.

New Rep. for Cowles Chemical

Chemray Corp., Westchester, Ill., will serve as dealer for Cowles metal finishing chemicals, providing additional coverage and service for the Chicago area metals trade, until now handled exclusively by Allied Research Products, Inc. Allied will continue as a Cowles dealer.

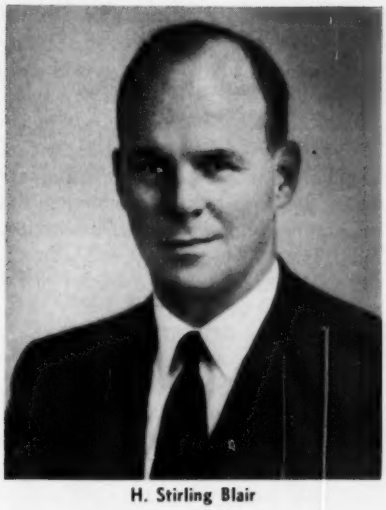
Ideal Chemical and Supply Co., Memphis, Tenn., has been appointed representative in Arkansas, Western Tennessee and Northern Mississippi, maintaining a stock in their Memphis warehouse.

The dealers are supported with technical assistance by Cowles personnel: *George Egger*, Midwest division manager, *Bob Sauter*, *Bill Swift* and *Ken Deerwester*, technical men, who work on metal cleaning problems in customer plants.

Raymond F. Ledford is president of Chemray.

Metal Finish Appoints Blair

Metal Finish, Inc., Newark, N. J., has announced the appointment of *H.*



H. Stirling Blair

Stirling Blair as manager of sales and service engineering.

Mr. Blair is a metallurgical engineering graduate of Rensselaer Polytechnic Institute (1949). He was previously general manager of Pabrico Steel Fabricators, Inc., of Paterson, N. J., and was with the Production Metallurgical Laboratory, Curtiss-Wright Corp.

Carborundum Personnel Changes

Dr. Hiram Paul Julien, formerly head of research on static electricity at Esso Research and Engineering Co., Linden, N. J., has been appointed manager of Advance Studies Department in the Technical Branch of *The Carborundum Co.'s* Bonded Abrasives Division. Dr. Julien holds an A.B. Degree in Chemistry from DePauw University and a PhD. in Physical Chemistry from M.I.T.

Five promotions in the Curtis Machine Division were also announced. *Richard D. Rutt* of Wilson, N. Y., formerly manager of the division's technical branch, was promoted to production manager. *Paul W. Joy*, Grand Island, N. Y., moved up from assistant manager to manager of the technical branch. *Adolph C. Carlson*, Grand Island, N. Y., supervising engineer, was promoted to manager of the machine design department. *William C. Keyes* of North Tonawanda, N. Y., advanced from design engineer to senior design engineer, and *Francis M. Owrey* of Niagara Falls, was promoted from senior draftsman to senior quality control engineer.

Koch Appoints Michigan Representative

Strong Engineering, Inc., Dearborn, Mich. has been appointed sales and service reprsentative for the Industrial Division of *George Koch Sons, Inc.*, Evansville, Ind., manufacturers of industrial finishing equipment.

Keith M. Strong, president of Strong Engineering, is a graduate mechanical engineer of Michigan College of Mining and Technology, 1948. He was formerly with York Corporation on refrigeration and air conditioning and with Johnson Service Co. on industrial temperature control contracting work. Since 1951, Mr. Strong has been prominent in sales and service of industrial finishing equipment.

Allen B. Repp, general manager, comprises the other half of the management team. Repp and Strong have

Keith M. Strong

been together since the firm was incorporated in 1954. Mr. Repp has had extensive experience in the automotive industry, including sixteen years with the Ford Motor Co. in the divisions of engineering, estimating and planning.

The company will cover the entire state of Michigan and part of Ohio. New property and building at 2211 Monroe St., Dearborn, Mich. has been purchased recently for permanent office and warehouse.

Hull Expands Detroit Office

R. O. Hull & Co., Inc. announces expansion of its Detroit Office at 3136 Hilton Rd., Ferndale, Mich.

The new enlargement provides 50% more warehouse space and additional laboratory facilities for greater service to customers. A new receiving dock will facilitate same day shipments to the eastern Michigan territory.

New Representatives and Distributors for Perfecto-Peen

Perfecto-Peen Division of *Aero-Test Equipment Co., Inc.*, Dallas, Tex., announces the appointment of new representatives and distributors for their process and equipment used in a new cost-saving method for peening, cleaning and finishing metal products.

Kenco, Inc., Wichita, Kan., is representative exclusively in the states of Kansas and Oklahoma. *Ken Cox*, Kenco president, plans to establish distributors in major cities in this territory.

Century Sales and Engineering Co., Olivette, Mo., covers Missouri. *Max Hutter*, president, announces that *General Aviation Supply Co.*, St. Louis, is the distributor in Kansas City and St. Louis.

Hawaii Chemical Co. Ltd., Honolulu, is exclusive representative and distributor in Hawaii. Sales activities in the islands are directed by *Ralph H. Marlowe.*

W. E. Cutrer Co., Dallas, is the new distributor in the Fort Worth-Dallas area. *Bill Cutrer*, owner of the sales engineering company, is maintaining a contract job shop in Dallas for the process.

Barrett Chemical Appoints Mexico Representatives

The *Barrett Chemical Products Co.*, Shelton, Conn., developers of sulfamate nickel plating processes, announce the appointment of *Enthone De Mexico, S. A.*, Ing. *C. Torres McDonald*, director, as manufacturers and exclusive representatives in Mexico.

Mr. McDonald has had many years experience in the metal finishing trade both in the United States and Mexico. He is a graduate of the School of Engineering at Texas A & M and founded the S. M. G. (Sociedad Mexicana de Galvanoplastia), Mexico's counterpart of the A.E.S.

Allan B. Black Joins Rona Pearl Corp.

Appointment of *Allan B. Black* as technical sales representative for *Rona Pearl Corporation*, a Division of Rona Laboratories, Inc., Bayonne, N. J., manufacturers of synthetic pearl and natural pearl pigments has been announced recently. He will service the New York City and Long Island territories in his new position.

Mr. Black was previously with the Ansbacher-Siegle Corp. in their sales department. He brings with him considerable background in the uses of pigments and pigment dispersions in the plastics, cosmetic, printing ink and coating industries.

Brown & Bigelow Offers Anodizing Services

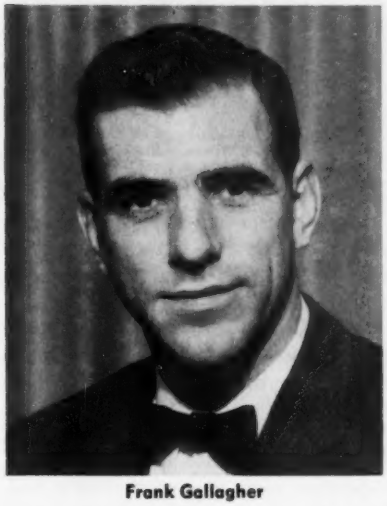
Brown & Bigelow, St. Paul 4, Minn., has announced that it is offering its hitherto exclusive aluminum anodizing

Earl Craft

and dyeing facilities to other companies on a commercial basis. The firm's processing plant at 1621 E. Hennepin Ave., Minneapolis, is expanding its program to include work for outside firms in the metals field.

Earl Craft, vice president-mechanical arts, will be in charge of the East Hennepin anodizing operation.

Field Engineer Named by Texas Instrument



Frank Gallagher

Frank Gallagher of Norton, Mass. has been named as a field engineer in the New England states, except Connecticut, for the General Plate Products group of *Texas Instruments Inc.*, Metals & Controls Division.

Mr. Gallagher received a BS degree in business administration from Boston College in 1951 and did graduate work at both Northeastern University and Boston College. He joined the General Plate Products group in 1957 as a product specialist in the Electrical Contact Sales Department.

Adolph Plating Purchases United Plating

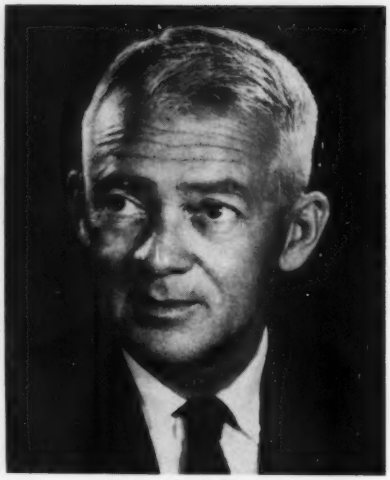
Adolph Plating, Inc., has announced the purchase of *United Plating Corp.*, 4600 West Palmer St., Chicago. This acquisition adds more than 41,000 square feet of custom electroplating and enameling facilities, totaling an overall occupancy of approximately 100,000 square feet of floor space.

Included in the operations of the newly acquired plant are machines equipped for custom spray painting and enameling, as well as polishing, buffing, gold and chromium plating.

Anodyne, Inc., Building New Plant

Anodyne, Inc., a new $750,000 multi-color anodizing and etching manufacturing facility, will soon occupy 28,500 square feet of plant area at Sunshine State Industrial Park located at 1400 N. E. 165th St., North Miami, Fla. Plant construction and equipment contracts were recently signed, work has begun, and occupancy date is targeted for June 1960.

Eugene T. Turney, Jr., board chair-



Eugene T. Turney, Jr.

man and president, is also president of North Shore Nameplate, Inc., a division of Anodyne, Inc., 214-27 Northern Blvd., Bayside, New York. This firm manufactures anodized etched, pressure-sensitive, aluminum foil name plates, plus a complete line of pressure-sensitive cloth markers and safety signs in equally wide industrial use.

When in full operation, Anodyne will be the parent company with North Shore Nameplate as one of its divisions.

Electronic Plating Corp. Formed

Vernon Julianne has announced the formation of the *Electronic Plating Corp.* at 58-15 57th Drive, Maspeth, N. Y. *Walter Weisenfeld*, another officer of the corporation, has had wide and varied experience in specification plating, especially in the precious metals field. Both men have had long and wide experience in electroplating; previously, they were responsible for production and research development at the Vernon Plating Co., which Mr. Julianne had started in 1944.

Novelty Imperial Japanning Co. Changes Name

Novelty Imperial Japanning Co., 415 N. Ashland, Chicago, Ill. has shortened its name to *Imperial Japanning Co. Claude A. Benjamin*, partner, also announced the admission of *Maxwell Goldberg*, general manager, and *William Woolf*, sales engineer, into partnership in the firm.

The company was organized on November 24, 1919, under the name of Novelty Japanning Co. and, through its absorption of Imperial Enameling and Japanning Works in 1930, evolved as Novelty Imperial Japanning Co. For more than 40 years, the company has been operating in the metal finishing industry both locally and nationally.

Goldberg has been with the firm for more than 22 years. He attended Northwestern University and is a specialist in business management. Woolf is a graduate engineer of the University of Michigan. He joined the firm in 1953.

Sparkler Relocates in Texas

Sparkler Manufacturing Co., manufacturer of filters, announces that it has moved its plant and office from Mundelein, Ill. to Conroe, Texas.

Pittsburgh Plate Promotes R. S. Michael in Paint Sales

Appointment of *Ralph S. Michael, Jr.*, as manager — industrial finishes, for the Paint Division, has been announced by *Pittsburgh Plate Glass Co.*

Mr. Michael has served as assistant general manager — industrial finishes sales, in the company's Pittsburgh general office since his transfer from the Milwaukee, Wis. paint factory in 1958. He joined the Milwaukee plant as an industrial sales trainee in 1940, and later served there as assistant sales manager — industrial finishes. Mr. Michael also was associated as an industrial sales representative for the Tulsa, Okla., and Kansas City, Mo. territories.

A native of Chicago, Mr. Michael is a graduate of Northwestern University and a U. S. Navy veteran of World War II.

Coated Abrasives Moves to Detroit Area

Coated Abrasive, Inc. has announced that transfer of manufacturing headquarters from Milwaukee, Wis. to the Detroit Metropolitan area has been completed.

The company's new manufacturing plant is located in Warren, Mich., General staff offices are at 11920 East Eight Mile Road, Detroit 5, Mich.

M-F Equipment Co. Formed

Formation of *M-F Equipment Co.* to handle sales of barrel finishing equipment to dealers has been announced by *Paul E. Kirchartz*, president of *Metal Finish, Inc.*, Newark, N. J. *W. H. Armstrong*, vice president of Metal Finish, has been named president of the new company which will headquarter at 410 Frelinghuysen Ave., Newark, home offices of the parent company.

W. H. Armstrong

Armstrong has been in barrel finishing many years, associated with Metalcraft Engineering, Inc.; Almco Division of Queen Stove Works, Inc.; and more recently with Minnesota Mining and Mfg. Co., St. Paul. He joined Metal Finish in 1958.

Sherwin-Williams Names Hill Director of Sales

Appointment of *Robert H. Hill* as director of sales for the *Sherwin-Williams Co.* was announced recently. He will supervise all domestic and export sales of the company, and will make his headquarters in Cleveland.

Hill has been identified with the firm since 1917 when he joined the company in his native Newark, N. J. He served in a number of sales assignments before being named manager of the Atlantic Coast transportation zone in New York. In 1953, he transferred to headquarters as general manager of transportation, industrial maintenance and painter-maintenance sales, the post he held immediately prior to his present appointment.

Widely known in the transportation finishes field, Hill is a member of the Construction Specifications Institute, the New York Railroad Club, the Railroad Machinery Club of New York, and the American Ordnance Association.

Burns Manager of New Department for Nalco Chemical

Robert R. Burns, formerly product manager for industrial process chemicals in the industrial division of *Nalco Chemical Co.,* has been appointed manager of a newly created commercial development department. The new department will search out and evaluate potential new markets and products and direct the marketing of new products until they are ready to be turned over to an operating division.

Burns is a chemical engineering graduate of Oklahoma A&M college and has been with the firm since 1956. Earlier he was with the chemical division of Armour & Co. and with Allied Chemical & Dye Corp.

Associated with Burns in the new department will be *Jerome Green,* who is presently on the staff of the company's Clearing laboratories.

Ferro Buys Vitro Pittsburgh Color Plant

Ferro Corporation of Cleveland, Ohio has acquired the 51-year-old *Vitro Mfg. Co.,* Pittsburgh, Pa., a division of *Vitro Corp. of America,* it was announced in a joint statement by officials of the two companies. The transaction was made in cash for approximately a half-million dollars.

Vitro manufactures a complete line of glass and overglaze colors, glaze stains, and porcelain enamel oxides. The new acquisition will round out Ferro's line of colors for porcelain enamel, clayware, and plastics.

Sanford Process Appoints Licensee

Technical Metal Finishing Co., 4435 San Fernando Road, Glendale, Calif., has been licensed by *Sanford Process Co., Inc.,* Los Angeles, for that company's aluminum hard coating process.

Established by *Burks M. Layne* in 1951, the licensee provides a complete range of metal processing services, including plating, anodizing, painting and fluorescent inspection.

Pangborn Corp. Names District Managers

Robert W. Gossard and *Herbert J. Niemann* have been named managers of *Pangborn Corp.'s* newly formed Milwaukee and Indianapolis districts. Mr. Gossard formerly served with the Chicago district as head of the Wisconsin branch office. Mr. Niemann had been sales engineer with the Chicago district.

Sole Chemical Moves

Sole Chemical Corp., Chicago producer of surface active chemicals, announces that its new and larger headquarters are located at 7740 S. Chicago Ave., Chicago 19, Ill.

Kenyon Appointed General Sales Manager of Kerns

Russell W. Kenyon

Russell W. Kenyon has been appointed general sales manager of the *L. R. Kerns Co.*, Chicago. He has been associated with the company for sixteen years, serving as Eastern regional manager for the last six years, and manager of the Detroit office prior to that time.

Catalin Corp. of America Transfers Guidice

John N. Guidice has been named a sales representative for the Resin and Chemical Division of *Catalin Corp. of America*. He will be located in the firm's Chicago office at 221 North LaSalle St. and will cover resin accounts in the Midwest.

Educated at Rutgers University, Guidice has been at the company's Fords, N. J. plant since 1955. Extremely well versed in resin technology, he has been employed in the central research laboratories.

Graver Adds Sales Reps. for Latin American Market

Reflecting increased activity in Latin America and the Caribbean area, *Graver Water Conditioning Co.*, New York manufacturer of industrial and municipal liquid treatment equipment, has announced the appointment of new sales representatives for those regions.

The new representatives include: *Navarro y MacMurray, S.A.*, Calle 26 Este No. 5-33, Panama City, Panama; *A. T. Schiller y Cia.*, Yerbal 341, Buenos Aires, Argentina; *Mastermax, Ltd.*, 44 Barry St., Kingston, Jamaica, B. W. I. *Representaciones Asociadas, Ltda.*, with main offices at Carrera la, #11-7, Cali, Colombia, has branch offices in Barranquilla, Bogota and Medellin.

Manufacturers Agents Named by Delavan

The *Delavan Mfg. Co.* of West Des Moines, Iowa, has announced appointment of two new manufacturers agents to serve as sales representatives for their line of industrial spray nozzles in their respective territories.

Hart Pump Engineering Co., P.O. Box 286, West Hartford 7, Conn. will represent the firm in Connecticut, Rhode Island and West Massachusetts.

Westco Pump Sales Co., 85 Industrial St., San Francisco, Cal. will sell the line in California, Nevada and Arizona.

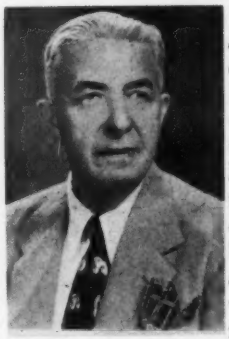
Maytag Company Promotes Eaton

Clarence Eaton has been promoted to head of the paint department at the *Maytag Company's* automatic washer and dryer plant.

Eaton, who joined the laundry appliance firm as a draftsman in 1937, had been a general foreman in the dryer assembly department since 1952.

OBITUARIES

WILLIAM SCHNEIDER



William Schneider passed away March 1, 1960. He was one of the founders of the National Electroplaters' Association of the United States and Canada, which was formed in 1909 and later, in 1913, became the American Electroplaters' Society. "Cyanide" Bill, as he was fondly called by his legion of friends in the plating field, was with the Roessler and Hasslacher Chemical Co., which was later to become the Electrochemical Division of E. I. du Pont. Bill retired from du Pont December 31, 1950 after serving the company for 38 years.

Bill, an honorary member of the

New York branch of the AES, was also a past president of the branch. He served on the Board of Managers for many years.

ARMAND FOUCHER

Armand Foucher, a service engineer with *The Chemical Corp.*, died on March 4, 1960 at the age of 44. A keen student of plating, he had acquired one of the largest libraries on plating literature now in existence.

He had been a member of the American Electroplaters Society for over twenty years and was president of the Hartford Branch at the time of his death.

Manufacturers' Literature

Abrasive Finishing Data Sheet for Silver

Lea Mfg. Co., Dept. MF, 16 Cherry Ave., Waterbury 20, Conn.

Step by step technical data on how to produce such finishes as dull mat, dull satin, butler, semi-mirror and mirror on solid silver and silver alloys, include recommendations for compounds, wheels, wheel speeds and buff lubrication.

Caustic Soda Additives

Chas. Pfizer & Co., Inc., Dept. MF, 630 Flushing Ave., Brooklyn 6, N. Y.

Data Sheet No. 549 refers to the above firm's gluconates as additives for caustic soda-aluminum etching solutions. Information is given on their advantages, preparation, operational recommendations, other applications, storage and handling, and packaging.

Dry Film Lubricant Coating

Poly Chem, Inc., Dept. MF, 541 So. Webster Ave., Indianapolis 19, Ind.

A 4-page, 2-color brochure explains the basic principles of Poxylube, a new moly base dry film lubricant that is applicable for commercial production use since there is no expensive surface pretreatment necessary prior to applying the lubricant.

High Velocity Dryers

J. O. Ross Engineering, Dept. MF, 730 Third Ave., New York 17, N. Y.

A new 4 page bulletin, HV-501, gives technical data on three new model high velocity dryers, with air outlet velocities from 15,000 to 20,000 feet per minute with temperatures to 800°F. and beyond in certain applications.

Filters

Commercial Filters Corp., Dept. MF, 2 Main St., Melrose, Mass.

A new 8-page catalog, GEO-506A, gives a brief description of each of the products in line of filtration equipment. Information is classified according to applications, operating pressures, and sizes. In addition to the filters, various types of filter media are described and illustrated.

Coatings for Vacuum Metalizing

Bee Chem. Co., Logo Div., Dept. MF, 12933 So. Stony Island Ave., Chicago 33, Illinois.

A new 45 page booklet describes in detail the application and use of vacuum metalizing coatings which may be applied by spraying, dipping, and flow coating to thermoplastics, thermosetting plastics, metals, and glass.

Base coats for use before metalizing as well as top coats and back up coats for use after metalizing are discussed, along with other helpful information on the metalizing operation.

Porcelain Enamel for Aluminum

Reynolds Metals Co., Dept. MF, Richmond 18, Va.

A new 22-page guidebook on the application of porcelain enamels to aluminum contains several illustrations in color, covers alloy selection, metal preparation, choice of frit, slip formulation, enamel application and firing.

In addition, the book compares the advantages of porcelain enameled aluminum to those of porcelain enameled steel.

Barrel Finishing Media

Abbott Ball Co., Dept. MF, 20 Railroad Ave., Hartford 10, Conn.

Bulletin AP-1 describes and illustrates the company's bearing balls, metal finishing materials, and decorative steel shapes. The advantages of construction, performance, and adaptability of each product are discussed in detail. Representative applications, size and dimensional data, and a list of sales agents are given.

Protective Organic Finishes

Glidden Co., Dept. MF, 900 Union Commerce Bldg., Cleveland 14, Ohio.

An informative new brochure de-

scribes a number of protective maintenance coating systems and matches them with specific application problems. Each page carries an index tab which indicates where a particular system should be applied. The copy backs up these tabs and explains the outstanding features of each system, suggests end uses, and gives a brief mention of the colors available.

A unique feature of the new brochure is a pocket on its back cover which contains data covering the results of three years of corrosion tests in simple, concise form.

Industrial pH Amplifier

Milton Roy Co., Dept. MF, 1300 E. Mermaid Lane, Philadelphia 18, Pa.

Data Sheet EIL 28 AM explains and illustrates the Model 28 AM industrial pH meter, a line-connected instrument specifically engineered for the measurement of pH in industrial manufacturing processes.

Stock Trucks

Palmer-Shile Co., Dept. MF, 16035 Fullerton, Detroit 27, Mich.

A copy of a new folder outlines the advantages of hand trucks engineered and manufactured for specific plant and warehouse materials handling problems.

Succinate Surfactants

Mona Industries, Inc., Dept. MF, Paterson 17, N. J.

A revised, comprehensive pamphlet, 212b, covers Monawet surfactants, a series of dioctyl, di-hexyl and di-isobutyl sulfosuccinates, available in liquid and powder form.

The bulletin includes new grades of the di-octyl and di-isobutyl grades in liquid and powder. Pharmaceutical grades of the sodium and potassium salt of the dioctyl sufosuccinate are also mentioned.

Floor Coatings

Carboline Co., Dept. MF, 32 Hanley Ind. Ct., St. Louis 17, Mo.

A new four page coating chart, No. 10, comparing protective coating systems for concrete floors, shows by columns the resistance of each system to chemicals, thermal shock, abrasion and temperature. It also gives the compressive strength, impact resistance, skid proof properties, thickness and cost per square foot of the individual systems. The ratings of unprotected concrete are included.

Blast Cleaning Barrels

Pangborn Corp., Dept. MF, Hagerstown, Md.

Bulletin No. 706 describes the exclusive features found in the standard duty line of Rotoblast cleaning barrels from 1½ to 18 cubic feet capacity. In addition to photographs and cutaway diagrams, the bulletin gives complete dimensions and specifications of each of the five barrels described, showing how each can be tailored to individual requirements.

A section is devoted to case histories of companies who have realized substantial profits and savings by using standard and automated barrels.

Sludge Collectors

Link-Belt Co., Dept. MF, Prudential Plaza, Chicago 1, Ill.

Book 2546 presents a complete line of six series and 15 types of Circuline sludge collectors available for water, sewage and industrial waste treatment settling tanks.

Replete with detailed engineering drawings and data, the book contains two tables; one gives the required surface area for various flows and surface loadings for a given settling tank size and the other shows how to determine tank dimensions, volume and weir length.

Blast Cleaning Abrasives

National Metal Abrasive Co., Dept. MF, 3560 Norton Road, Cleveland 11, Ohio.

The "facts of life" concerning the use of shot and grit abrasives in blast cleaning are detailed in an enlightening and thorough manner in a new, fully illustrated, 30-page booklet, conveniently divided into five sections.

New Electrocleaner

Clarkson Laboratories, Inc., Dept. MF, 930 N. Darien St., Philadelphia 23, Pa.

Bulletin #2A describes a new heavy duty cleaner for steel, Clarco Electrocleaner 751.

Work Gloves

Monte Glove Co., Dept. MF, Maben, Miss.

A new work-glove catalog includes leather, neoprene coated, plastic coated, abrasive finish plastic coated and other materials. Listed items range from women's garden gloves to welder's gloves and mittens.

Protective Coating

Prufcoat Laboratories, Inc., Dept. MF, 63 Main St., Cambridge 42, Mass.

Bulletin No. 540A contains data on the chemical and physical properties of Primastic, a fibrated epoxy mastic coating, as well as application and cost information.

Fabricated Plastics

Argo Plastic Products Co., Dept. MF, P. O. Box 3541, Cleveland 18, Ohio.

A four page, illustrated booklet is available which describes the above firm's plastic fabrications and fittings for corrosive applications including exhaust, process and piping systems, air washers, and tanks for mixing, storage and compounding.

Rubber-Bonded Abrasives

Cratex Mfg. Co., Inc., Dept. MF, 1600 Rollins Road, Burlingame, Calif.

A new application manual for industrial use includes information concerning the many uses for rubberized abrasives, case histories on a variety of typical applications and a copy of the latest catalog. The most efficient methods for mounting, dressing and trueing and recommended operating speeds are given in brief but complete form. Actual field applications are described.

Surfactants

Onyx Oil & Chem. Co., Dept. MF, Jersey City 2, N. J.

In a new 24 page catalog of surface active agents each product is described by trade name, active ingredient, per cent activity, physical state, general use, specific applications and properties.

The products are divided into three general classes: anionic, cationic and non-ionic. There is a 2 page section explaining the chemistry of each of these groups.

Constant-Temperature-Humidity Testers

American Instrument Co., Inc., Dept. MF, 8030 Georgia Ave., Silver Spring, Md.

Environmental test equipment that duplicates global climatic conditions, test cabinets large and small, baths, ovens, and steam-humidity chambers are among the instruments described in a new catalog, No. 560. It includes 41 pages of illustrations, descriptions, applications, and a temperature conversion chart from C to F, or F to C.

A list of the sales engineering offices located throughout the U.S.A. is also included as a ready reference for persons seeking technical assistance in setting up complete systems for conducting tests under controlled humidity and temperatures.

Barrel Finishing

Tumb-L-Matic, Inc., Dept. MF, 39 St. Mary's St., Stamford, Conn.

Four new technical process bulletins have recently been published by the above manufacturer.

Bulletin TPB-2 explains a low cost method developed for imparting lustrous or glossy material finishes to items not expected to retain their sale finish after a long period of use.

Bulletin TPB-4 goes into the procedures to be followed for the removal of shear marks, concavity and surface defects from raw plastic button blanks as well as the polishing of faced and drilled buttons.

Bulletin TPB-3 deals with the process developed for achieving color, luster and texture directly comparable to that achieved by hand buffing.

Bulletin TPB-5 offers information on the preparation of resistor leads prior to tin electroplating and hot dipping.

Infrared Heating

Fostoria Corp., Infrared Div., Dept. MF, Fostoria, Ohio.

A comprehensive 20-page infrared bulletin in 2-colors gives complete information on infrared heating, its principles, advantages, applications (illustrated), and typical standard systems.

Catalyst Applications to Ovens

Catalytic Combustion Corp., Dept. MF, 4725 Fourteenth St., Detroit 8, Mich.

A four-page illustrated brochure describes applications of catalysts to continuous strip ovens. Featured is the use of long-life metallic supported catalysts in the conversion of noxious combustible waste gases to valuable heat energy; resulting in economic savings and improved plant safety, as well as effective air pollution control.

Graphite Heat Exchangers

Carbone Corp., Dept. MF, Boonton, N. J.

A new twenty-page engineering

manual on Polybloc impervious graphite heat exchangers features full-page illustrations, cutaways, diagrams, and design data. Also among the useful contents are charts, graphs, typical calculations, examples and specifications. The principles of operation are lucid and well demonstrated. At the back of the manual there is a full-page, perforated inquiry-data sheet which should prove valuable to companies seeking further information and a solution to current problems.

NEW BOOKS

General Chemistry

By Roland M. Whittaker. Published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 1959. 751 pages, including index. Price: $12.50.

This is just the textbook for platers who need a self-teaching manual on elementary chemistry, since the first six chapters are devoted to introductory information for the beginner. For those who have had high school chemistry years ago, the book will serve as a refresher and will bring them up to date on the newest concepts. They can run through the first six chapters rapidly, reserving their attention to the balance of the material, which is presented in a clear and simple style. The text is not overburdened with unnecessary illustrations; those diagrams which are included will be helpful in clarifying the subjects. Although selection and condensation are necessary to avoid overwhelming the student, the material has been presented in a systematic manner which lends itself to ready understanding.

Electroless Nickel Plating STP 265

Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 1960. 74 pages. Price $2.50.

This small book is a compilation of just about all the known information on the subject. Originally presented at a symposium by some of the foremost authorities, the papers are now available under one cover. Subjects covered include chemical reactions, deposit characteristics, processing procedures, applications, advantages, test methods, patents, and references, prefaced by a history of the process.

News from California

By Fred A. Herr

E. Stuart Krentel has resigned from the technical sales staff of Kelite Products, Inc. and, effective February 1, went into business for himself. Krentel has acquired from *Robert B. Gray* of the Duraplate Corp., Burbank, Calif., sufficient production equipment to establish a job plating shop at 141 N. First St., Burbank, which he is operating under the name of Krentel Plating Co.

The shop has been equipped to spe-

cialize in production plating. Initial facilities in the 5,000 square foot plant include equipment for decorative nickel and chromium plating, and the polishing, buffing and cleaning operations that go with it. He has a staff of 18 shop men.

Krentel is a graduate in chemical engineering from Michigan State University. He came to Los Angeles in 1947 as West Coast manager for MacDermid, Inc. During the ensuing 12 years he has also been active in technical and sales engineering positions with the A. J. Lynch Co., Hanson-Van Winkle-Munning Co. and Kelite, Inc. Krentel has served as 2nd, and 1st vice-president and president of Los Angeles Branch, A.E.S., has been active on many committees, and represented the branch as delegate at several national conventions.

Daniel H. Ross, formerly on the technical sales and service staff of MacDermid, Inc., in the Waterbury, Conn., area, has been transferred to Southern California as a technical sales representative under *Claude Weekly,* West Coast manager.

Bud McDonald, who three years ago was named general plant supervisor of the Hall-Mak Co., Los Angeles, as successor to the retired *Don Bedwell,* recently was appointed vice-president in charge of production. *Norman Painter,* assistant plant supervisor, has been promoted to plant supervisor, with direction over all operations including plating, polishing, and buffing.

Painter has been with the company since 1937. He started as a plating shop worker, and subsequently was advanced to the posts of foreman of plating, general shop foreman, assistant plant supervisor, and now general plant supervisor.

Mr. Bedwell, who served as general plant supervisor for the company for 20 years, is reported to have recovered from the heart attack he suffered on a European tour last summer. Mr. and Mrs. Bedwell are planning a trip to Japan, with the decision uncertain as to whether they will leave before or after the AES convention to be held in Los Angeles in June.

A visitor to Southern California in mid-February was *Leo Rosenberg,* treasurer of Reliable Silver, Inc., Somerville, Mass. Mr. Rosenberg's firm specializes in precision plating for the electronic industries to government specifications. He attended the February 10 meeting of Los Angeles Branch, A.E.S. as the guest of *Henry Saakland* of the Vineland Plating Co., Burbank, Calif.

Holga Metal Production Co., Van Nuys, Calif., has installed new equipment including degreasing, paint spray, and enamel baking facilities, for finishing metal office furniture and equipment.

The installation consists of a space-saving integrated system, including a radiant degreasing oven, two paint spray booths, a radiant paint baking oven, and a recirculating paint supply system. The recirculating system supplies paint to each booth from a central storage area.

Manual handling of parts is eliminated by a continuous overhead conveyor system. The parts travel at a speed of three feet per minute through a full finishing cycle that involves 94 minutes. The cycle allows 3.6 minutes in

the degreaser oven, 4 minutes in each paint booth, 7.3 minutes in the bake oven, 3 minutes flash time, and 15 minutes cool-down time.

The R. C. Mahon Co. of Detroit, Mich, has opened two West Coast sales offices for its steel and building products division. The Southern California office is located in 2303 Jefferson St., Torrance, Calif., the city in which the firm's Western Division plant is situated. A northern California office has been opened in the Pacific Building in San Francisco.

Recent executive promotions and personnel changes in West Coast concerns in or allied with the metal finishing industry include the following:

Victor M. Schwartz, executive vice-president and general manager of L. H. Butcher Co., Los Angeles, a subsidiary of the Udylite Corp., Detroit, Mich., recently was elected to the Udylite board of directors.

Dr. Leland G. Cole has been named vice-president in charge of research for Beckman Instruments, Co., Fullerton, Calif.

Edward E. Anderson has retired as vice president in charge of West Coast operations for Metal & Thermit Corp. He had served the company as director of manufacturing operations in San Francisco since 1941.

Dr. Kenneth W. Gardiner has been appointed chief research chemist for Consolidated Electrodynamics Corp., Pasadena, Calif., a subsidiary of the Bell & Howell Co. Gardiner was formerly director of the General Chemistry Laboratory for the Continental Can Co.

Climax Molybdenum Co., a division of American Metal Climax Co., Inc., has named *John V. Houston, Jr.,* as assistant manager of West Coast sales and development, with headquarters at the Los Angeles office.

Kenneth Bellinger of the Conversion Chemical Corp., addressed the February 11 meeting of San Francisco Branch, A.E.S. on "Trouble Shooting in the Plating Shop." A question-and-answer period directed by President *Trevor Harry,* after the conclusion of the talk, precipitated a stimulating discussion on plating shop problems.

Duane Heinlan, Elston A. Flores and *John Tracy* were elected to serve as Branch sergeants-at-arms. The following matters were discussed during the February business session: ways and means of forming an A.E.S. regional group; distribution of an A.E.S. booklet designed for membership increase; distribution of material on *Robert Girard* for nomination as national 3rd vice-president; and instruction of delegates to the national convention.

The January meeting was addressed by *Leo Missel,* formerly a member of Los Angeles Branch, on the latest technique for cleaning and plating beryllium.

The Los Angeles Paint & Varnish Production Club has up for voting at its next general membership meeting a proposed amendment to the by-laws which calls for change of name to Los Angeles Society of Coating Technology.

The speakers at the February 10 meeting in the Montebello Country Club, Montebello, Calif., were *Robert L. Balfor,* sales manager, and *Raymond Lu Bien,* technical sales director, of the T. F. Washburn Co., Los Angeles. Their topic was "Natural Thixotropy."

Ace Allied Porcelain & Refinishing Corp. of San Francisco recently installed a new vitreous enameling furnace for job work. The new furnace measures 5 by 5 feet and is 12 feet long. It is reported to be capable of temperatures up to 1,800°F. The company has installed a fuel saving innovation in the form of facilities that permit exhaust gas from the furnace to be piped to a dry-off oven.

The 5th Pacific Coast Paint Production Clubs Symposium and Materials & Equipment Show was held at the Statler-Hilton Hotel, Los Angeles, February 25-27.

Fourteen original research papers were presented on the technical program. Among the topics dealt with were solvents, accelerated weathering, reflective studies, new heat reactive oils, new polymers, emissivity coatings, alkyd copolymers and coatings for corrosion, plus five papers on emulsion coatings and their industrial application. The program also included a Corrosion Panel Discussion directed by four authorities on iron and steel corrosion, marine corrosion, oil field corrosion and aircraft metallurgy.

Fifty exhibitors participated in the materials and equipment show.

The recent move of Acme Galvanizing Co., Inc., of Oakland, Calif., into a new $300,000 plant of 15,000 sq. ft. floor area at 1655 17th St., Oakland, marks a tripling of the firm's former plant area and quadrupling of its galvanizing facilities in the past 15 years.

Owner *Thomas R. Collins* started operations in 1944 in a 5,000 sq. ft. shop, equipped with one 10-foot dip galvanizing kettle. The new plant is equipped with a 32-foot kettle with a capacity of 9,000 pounds per hour.

One of the firm's operations involves the galvanizing of large sign structures, light standard and highway electroliers, and the new plant is reported to be

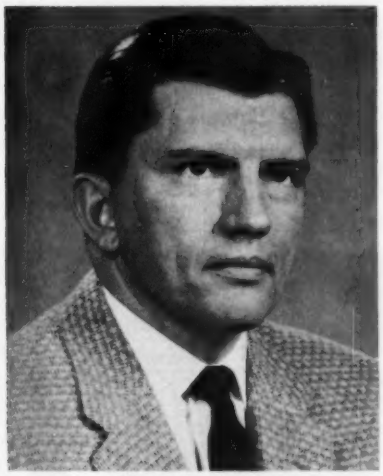
equipped to handle any of the sizes in this field. The new galvanizing kettle is 43″ wide by 52″ deep by 32′ long. Three three-ton overhead cranes are capable of handling loads up to nine tons.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Nominees for 3rd Vice Presidency

At the Interim Meeting held at the Benjamin Franklin Hotel in Philadelphia February 19 and 20, two candidates, *Frank Beuckman* and *Robert Girard*, were nominated to run for the 3rd vice presidency of the National Society.



Frank Beuckman

Frank Beuckman, of the Rochester Branch, has been associated with technical development at Eastman Kodak Co. for more than twenty years.

A graduate of the University of Rochester, where he received a B.S. degree in chemistry, Frank is an inventor and co-inventor of several processes in the metal finishing field. His technical achievements are related to his responsibilities at Kodak Park Works, the company's photographic film, paper and chemicals plant, where he is currently a development engineer in research and development in the metal finishing department.

Frank has been a delegate to the Supreme Society for ten years. In 1957-58 he served on the Paper Awards Committee and in 1958-59 became chairman of the Committee. He was elected president of the Rochester Branch for 1957-59. Previously, he had been named educational chairman of the 1955 State Regional Meeting, and three years later he became general chairman of the successful 1958 Empire State Regional Meeting.

The candidate is presently serving as liaison representative for the Research Finance Committee in the Empire State Region and is a member of the Empire State Regional Board. He is also an instructor at the University School of the University of Rochester where he teaches an evening course in electroplating and metal finishing.

Robert Girard, of the Springfield Branch, is foreman of the Metal Finishing Shops of the Armory Operations Division at the Springfield Armory in Springfield, Mass., with responsibility for all metal surface treating and plating operations on a production basis.

A native of Chicopee, Mass., where he was educated in the local schools, Bob attended Syracuse University, evening courses at the University of Massachusetts, and North Eastern University.

His practical shop background prior to the position he now has includes part ownership and operator of a job shop and research and development work at the Springfield Armory laboratories developing techniques for hard chromium bore plating of gun barrels.

Bob has done considerable work in developing a variety of finishes and adapting them to production methods, and he also received a patent on an electroless nickel process.

The candidate worked his way from

Robert Girard

secretary to the presidency of the Springfield Branch, has been a member of the New England Regional Committee for the past five years, and conducted a course in "Fundamentals of Electroplating," sponsored by the Branch, in 1957. For the past five years he has been a delegate to the National Supreme Society.

CONVENTION NEWS

The Los Angeles A.E.S. Convention Committee continues to report progress in the plans for the National Convention to be held July 24-28 at the Statler Hilton Hotel. A large attendance is expected with the dates set purposely to tie in with the vacation season. The educational program will feature an eight paper symposium on hydrogen embrittlement. Plant visits will include

the United States Chemical Milling Corp. There will be two other plant visitations.

The Metal Finishing Suppliers' Association is changing its usual practice this year by sponsoring two social events, the Monday night reception without the usual buffet dinner and a cocktail hour before the banquet Thursday night. Two fine orchestras will play at the Monday night affair.

The children's program looks interesting as it includes Knotts Berry Farm and Ghost Town, Marineland, and a Western Movie Studio where the Western Movies and T. V. pictures are made, providing the studio schedule is cleared for the day that is set for this. Studio schedules are not set this far ahead. There will also be a lunch at the Town and Country Farmers Market, a famous place for such events. All trips are chaperoned.

The customary outing for the entire convention will be an excursion to famous Disneyland.

Tony Stabile of the Associated Plating Company is general chairman. Hotel reservations are now coming in at a high rate this far in advance. Write

Disneyland, California, is a wonderful place for the family camera, where children can be photographed in surroundings that bring their own fantasies to life.

Miss Nina L. McGovern, Housing Director A.E.S., Los Angeles Convention Bureau, Inc., 404 South Bixel Street, Los Angeles 54, California.

Newark Branch

President *Fred Meyer* called the Feb. 19 meeting to order at 8:30 p.m. and presented *Paul Bier* as a guest of the Branch. Applications for membership were received from *Theodore Scheik* and *Mykola Bazyluk* and recommended that they take the regular course. *Allan K. Booth* was elected to membership.

President Meyer announced that the executive committee of the Branch had selected *F. J. LaManna* as choice to receive the Charles Proctor Award. His name will be submitted to the National Society.

Al Korbelak then introduced *Cy LaManna* whose timely topic on "Barrel Plating" was quite complete for the limited time available. He discussed degreasing, pickling, and plating conditions, as well as the size and types of loads necessary for good plating as well as barrel protection.

J. F. Harper, of Harper Buffing Machine Co., discussed, in general, the types of media, abrasives and lubricants, employed in wet and dry tumbling; and indicated that both very light and delicate parts as well as relatively heavy parts could be buffed in

this manner. This lecture was amplified by both sketches and slides. It was generally agreed that his products have a place in the metal finishing industry.

After a lively question and answer period, both speakers were given a rising vote of thanks. It was much later before they were able to pack up and leave.

The well being of Messrs. *George Wagner* and *Roy Sage* were toasted by approximately thirty members at the Dutch Treat dinner prior to the meeting.

Gustav Bittrich,
Acting Secretary

Waterbury Branch

The Waterbury Branch held its annual Valentine's Day Party at the Waterbury Country Club on Saturday Evening, Feb. 6. The event featured a Branch-sponsored cocktail party followed by a fine dinner and dancing to the music of Arnold DiPietro and his orchestra. A fine time was had by all.

F. A. Schneiders,
Publicity

Providence-Attleboro Branch

An Electroplating Seminar co-sponsored by the Branch and the Division of Engineering Research and Development of the University of Rhode Island will be held at Kingston, R. I. on Saturday, May 21, 1960.

Program:

10:00 A.M.
Registration and Coffee Hour

10:30-12:00 NOON
Tours of Campus

12:00-1:00 P.M.
Luncheon-University Dining Hall

1:30-5:00 P.M.
Technical Sessions

"Acid Pickling and Bright Dipping" *Dr. Walter Meyer,* president, Enthone, Inc. New Haven, Conn.

"Anodizing of Aluminum as Compared to Electroplating" *Byron Abedon,* vice-president of research and development, Engineering Products & Specialties, Inc., Pawtucket, R. I.

"The Role of Specifications in Precious Metals Plating" *Eldridge Camp,* I.B.M. Corp., Poughkeepsie, N. Y.

"Plating Instrumentation and Controls". Speaker to be arranged

3:00 P.M.
Coffee Break

5:30-6:30 P.M.
Cocktail Hour — Larchwood Inn, Wakefield, R. I.

6:30-7:30 P.M.
Dinner at Larchwood Inn

Los Angeles Branch

Action designed to make the work of the branch librarian more effective was initiated at the February 10 meeting in Rodger Young Auditorium, Los Angeles. A motion was made by past-president *E. Stuart Krentel* that Article 5 of the by-laws be amended to redefine the duties of the librarian to the effect that the office of branch librarian hereafter consist of a chairman and two elected assistant librarians. This would expand the position to three persons from the present one.

Krentel pointed out that the librarian has one of the most difficult tasks in the branch in that he is faced with arranging for monthly speakers and/or groups of speakers to serve on panel discussion programs. The task is made more difficult, Krentel stated, when a

new librarian is elected each year, who must start from scratch with no previous experience in technical programming. By electing a chairman and two assistants, Krentel said, the librarian's post would become a sort of interlocking position in which one of the two assistants could be elected the following year and, thus, have the experience of a year's activity in arranging for meeting programs.

The amendment proposal will be given a public hearing at the March meeting and submitted to a vote of the membership at the April 13 meeting.

Secretary *Harvey K. Hunt* read a letter from *James Weaver*, secretary of Phoenix, Ariz., branch. Mr. Weaver's letter stated that Phoenix Branch favors a closer alliance with other West Coast branches through a West Coast Regional Conference in which Los Angeles, San Francisco, Portland and Vancouver branches would participate. President *George Hetz* referred the letter to the board of governors for evaluation.

Francis T. Eddy, past national president, was called upon by the chair to comment on arrangements being made for the 1960 AES convention in Los Angeles. Mr. Eddy said that, in his opinion, the arrangements under General Chairman *Tony Stabile* are proceeding on a scale that should assure one of the finest and best-attended conventions in the history of the Society.

Seven new members were initiated by President Hetz. They were *Ronald S. Wida*, *William Bachman* and *Alfred Euakdieri*, all of the Shore-Calneva Co.; *R. Keith Hibb* of Aircraft Bolt Co.; *Richard A. Snyder*, Pennsalt Corp.; *Donald L. Crane*, Chem Research Co.; and *Michael Vasquez*, Cannon Electric Mfg. Co.

The nominating committee consisting of *Larry O'Neil* (chairman), *E. Stuart Krentel* and *Truman Stoner*, submitted the following recommendations for 1960-61 officers: president, *Frank Virgil*, L. H. Butcher Co.; 1st vice-president, *Emmett Babcock*, Convair, Inc.; 2nd vice-president, *Harvey Hunt*, Alert Supply Co.; treasurer, *Harold Wannamaker*, deburring shop operator; secretary, *Robert Pooler*, Harvey Aluminum Co.; librarian, *Clare P. VerWest*, Mefford Chem. Co.; board of managers, *Norman McEwan*, Virtue Bros., *Norman Painter*, Hall-Mak Co., and *Larry O'Neill*, L'Hommedieu Co.

Ellis P. Owen

The speaker of the evening was *Ellis P. Owen*, senior process engineer, Guided Missile Division of the Firestone Tire & Rubber Co., whose talk was devoted to "Quality Control of Aluminum Hard Coating." The paper was originally prepared for presenta-

tion before a meeting of the Society of Non-Destructive Testing as part of the 1959 Western Metal Show program in Los Angeles.

Mr. Owen discussed current methods used for non-destructive testing of aluminum hard anodizing. He offered a comparison of the relative merits of the different methods that have resulted from research work in this problem. He also offered a comparison of eleven methods for coating evaluation, covering both hard anodizing on aluminum and also for some other types of hard coatings. He discussed in detail the methods determined most suitable. Mr. Owen stated that results of the research are still being evaluated for inclusion in Government specifications covering non-destructive tests for quality determination of aluminum hard anodizing.

Rochester Branch

The February 4th meeting was called to order by President *Anthony Cottrone* at the Rochester German Club.

Business matters discussed were:

1. The formation of a committee consisting of 2nd Vice President *John Cippola* and *Vern Schaeffer* to express the sympathy of the Branch when death occurs in a member's family.

2. An invitation was extended to the members to attend the Empire Regional Meeting to be held in Elmira in April.

3. The formation of a committee consisting of *Emil Pottridge, John Cippola* and *Charles Fideor* to investigate the merits of changing the Branch's social calendar to either or both a Christmas Party and a Spring Dinner-Dance.

4. The announcement of past-president *Frank Beuckman's* candidacy for 3rd Vice President of the Supreme Society was received with great enthusiasm. The Branch has pledged its full support in his behalf.

Following the business portion, the meeting was turned over to Librarian *Frank McNutt*, who introduced the speaker, *Dr. Richard Saltonstall* of the Udylite Corp., who spoke on "The Role of Agitation in Electroplating."

At the conclusion of Dr. Saltonstall's very interesting talk, refreshments were served through the courtesy of *Tye Moffatt*, Udylite area representative.

Barrie M. Gardner
Secretary

Columbus Branch

The meeting on February 4, with 33 present, included announcements regarding the coming Tri-State meeting, the Columbus Technical Council Banquet on February 25, and the Interim meeting in Philadelphia. The Branch gave a vote of thanks to *Charles Murphy* who donated membership pins to local Branch officers to encourage wearing of the pins by all members.

Librarian *Hugh Miller* introduced the speaker of the evening, *Carl Jund*, of Globe Chemical Co., Inc., Dayton, Ohio. Mr. Jund spoke on "New Facets of Electropolishing." His talk emphasized the use of electropolishing of steel for functional purposes. His conclusions were supported by interesting case histories. The question period which followed provided answers to questions on details of electropolishing and on its use for decorative purposes.

The Blue Ridge Branch

The regular monthly meeting was held on February 5 at the Elks Club in Greensboro, N. C., with 20 members and guests from Greensboro and Win-

ston-Salem, N. C., Bristol, Tenn., Chestertown, Md., and Matawan, N. J., to hold one of the best all around meetings of the season. *Dr. Walter Kleiner* of Hanson-Van Winkle-Munning Co. delivered a very informative talk on "Leveling and Brightener Consumption in Bright Nickel," which was attentively received. The social hour followed the speaker and this new idea was accepted and enjoyed by all. *Mike Milo* and *Frank Holliday* made the arrangements with the Elks Club and, from the results and cooperation from the Elks Club, it looks as if the branch might meet there the next time Greensboro comes up again.

Robert H. Probert
Secretary

Phoenix Branch

The regular monthly meeting was held Tuesday, Feb. 9 at the Armed Services Officers' Club, 3334 E. Camelback. After the usual social hour and dinner, the business meeting was called to order by *Bill Griff* at 7:30 P.M. A committee meeting of those concerned with the March symposium will be held at the Outpost Monday, February 15th.

George Carlton invited members to attend the A.S.M. Social Meeting at Bud Brown's Barn and suggested a future meeting with A.S.M.

We will receive the MFSA Award of $100.00 by May.

Our approved By-Laws have been forwarded to the Supreme Society.

Members were urged to get their reservations in soon for the Los Angeles Convention.

Librarian *Paul Wible* introduced the speaker, *Sam Beal*, of Oakite, Inc. The members appreciated the informative talk on an important subject — "Fundamentals of Metal Cleaning." Meeting adjourned at 9 P.M.

James E. Weaver
Secretary

Tri-State Regional

John F. Harper

One more speaker has been announced for the sixth annual Tri-State meeting to be held at the Sheraton-Gibson Hotel in Cincinnati on Saturday, April 23rd. He is *John F. Harper*, president of Harper Buffing Machine Co., whose topic is *The Harperizer — A New and Fresh Approach to Problems of Mechanical Finishing*. In his talk, Mr. Harper will describe a machine that utilizes a new principle in free-grain finishing, without buffs or fixtures.

The other details regarding the meeting were given in the March issue.

Chicago Branch

On February 12, the branch held their monthly meeting at Stella's Restaurant, 3206 North Kostner Ave. Due to the bad weather, a small group of members was present at the meeting. The annual banquet was a tremendous success, the food was very good and the floor show superb. *Al Poe* and *Don Morris*, of the banquet committee, were given a vote of thanks for a job very well done. *Charles Geldzahler*, president, gave thanks to all the suppliers for their "hospitality suite." Four new members were voted into the Branch and four applications were turned over to board of managers for approval. *Larry George* is working out the details with the railroad for a special train to the convention in Los Angeles. Mr. Poe and the publicity chairman were appointed by Mr. Geldzahler as "tellers" for the nominations of new officers at the next meeting. *Simon Gary*, librarian, introduced the guest speaker of the evening, *W. J. Walther* of the Roto-Finish Co., whose subject was "New Developments in Barrel Finishing — Equipment, Processes and Materials."

Mr. Walther showed slides of vibratory equipment produced by his company and parts that were processed in this manner. He also discussed the type of media and compounds used in the process. Following a question and answer period, Mr. Walther was given a vote of thanks for his informative talk.

Christopher Marzano
Publicity Chairman

Dallas-Ft. Worth Branch

The February meeting of the Dallas-Ft. Worth Branch was held in the Banquet Room of the Howard Johnson's Turnpike Restaurant on Wednesday, the 17th.

Following the usual 6:30 Fellowship Hour, Branch President Browning called the meeting to order with thirty-

seven members and guests in attendance. Secretary-Treasurer *A. C. Fricke*, presented the minutes and financial report. Upon a unanimous vote of the executive council at their meeting one week earlier, a special fund was started towards sponsoring the Branch in the Council of Scientific Societies (Dallas-Ft. Worth). Past President *E. R. Rinehart* was presented by First Vice President *W. L. "Bill" Aves* as the founder of the "Door Prize" Affair. *N. Rogers* of Bell Helicopter Corp. walked off with a beautiful precision fishing rod set. Program Chairman *D. L. "Don" Allie* introduced the panel. Mr. Rinehart acted as panel chairman. The panel consisted of the following:

John Lane, Lane Plating Works, "Cleaning Prior to Chromium Plating."

E. R. Rinehart, Chance-Vought Aircraft, "Production Aircraft Plating Pretreatments."

Fred Howard, Bell Helicopter Corp., "Preparation for Organic Finishing."

A. E. Hohman, Chance-Vought Aircraft, "Organic Metal Pretreatments."

Doug Cox, Cox Testing Labs, "Importance of Analysis and Control."

Dr. T. C. Franklin, Baylor University, "Theoretical Aspects in Plating."

Each panel member presented a 10 minute dissertation prior to a general open meeting discussion. This meeting proved, by far, the most widely discussed and participated session the Branch has witnessed in several years.

Branch members from areas as far as Lubbock and Waco, Texas, entered into the interesting discussion. *W. N. Renfro* and *Walt Nater* of Lubbock, Texas won special acclaim for their long trip as members coming the longest distance — three hundred miles!!

A. C. Fricke,
Secretary

St. Louis Branch

The regular monthly dinner meeting was held at the York Hotel with 19 members and guests present for dinner. There were 28 members and guests present when President *William Piel* called the business meeting to order.

Communications consisted of the letter announcing the Philadelphia Interim meeting. There were no applications for membership. The school was reported going well with 31 enrolled. They expect 25 next term. The entertainment committee reported that the 10th annual spring banquet would be held May 7th at the Ambassador Hotel. A steak dinner will be the menu and *Bobby Swain* will furnish the music as before. The price will be $10 per ticket.

Andy Julius and *Bill George* attended the Chicago banquet and the midwest regional meeting. Andy also reported that we are being asked to name the headquarters hotel for the 1964 convention. It was decided that the decision could not be made until we know for certain whether the exposition will be held here that year.

The secretary was instructed to prepare the papers recommending *Ed Sertl* for the Charles Henry Proctor Achievement Award.

New business consisted of a suggestion that 150 extra copies of the meeting announcements be printed. These would be mailed to managers of companies and ask that they try to get some of their personnel to attend the meetings. The branch would pay the postage and *Jerry Clooney* would take care of the mailing.

The meeting was then turned over to Librarian *Richard Gotsch*, who introduced *James Rice*, product engineer for Behr-Manning Co. His talk entitled "Off-Hand Finishing with Coated Abrasive Belts" was accompanied by a 16mm color sound movie which gave a brief description of how coated abrasive belts are used in metal finishing. A question and answer period followed. The meeting was adjourned with a rising vote of thanks to Jim for his talk.

Ward W. Kelly
Secretary

Buffalo Branch

The branch held its meeting Friday, Feb. 5 at the Niagara Manor, Buffalo, N. Y., with 26 members and 5 guests in attendance.

Arthur Neubauer of Platecraft of America in Buffalo, N. Y. and *Louis Walczak* of Deluxe Plating, Buffalo, N. Y. were elected to membership. *Harold Shapiro* introduced the guests of the evening, then outlined the program *Paul Conn, Chuck Fotheringham* and he have followed in contacting job shops and various manufacturing concerns in the area regarding employees who could benefit from AES membership.

The membership voted to submit to the Technical Societies Council the names of *Dr. C. J. Wernlund* and *Harold Shapiro* as outstanding members of the Branch. Awards will be presented by the Council to such members in recognition of the contribution they have made to their society.

Ray Kilroy announced that *Wally Keefe* who was confined to the hospital due to a coronary attack recently has returned home. Recognition was given to *Boris Joffe* by President *Rolland Campbell* in behalf of the branch for his translating of a number of foreign articles on plating.

Election of officers will be held at the April meeting and installation at the May meeting. Efforts are underway to secure a member of the national body

Calendar of Association Meetings

Apr. 22: Board of Directors, N.A.M.F., Sheraton-Gibson Hotel, Cincinnati, Ohio.

Apr. 23: 6th Annual Tri-State Meeting, A.E.S., Sheraton-Gibson Hotel, Cincinnati, Ohio.

Apr. 23: 21st Annual New England Regional Meeting, A.E.S., Hotel Statler, Hartford, Conn.

Apr. 29-30: 6th Empire State Regional Meeting, Mark Twain Hotel, Elmira, N. Y.

May 9-13: 2nd Southwestern Metal Exposition and Congress, A.S.M., Automobile Bldg., Dallas, Texas

May 14: 42nd Annual Banquet, M.E.P.A., The Plaza Hotel, New York, N. Y.

May 21: Electroplating Seminar, co-sponsored by Providence-Attleboro Branch, A.E.S., and Div. of Engineering Research and Development, University of Rhode Island, Kingston, R. I.

July 22-24: 5th Anniversary Convention, N.A.M.F., Statler-Hilton Hotel, Los Angeles, Calif.

July 24-28: 47th Annual Convention, A.E.S., Statler-Hilton Hotel, Los Angeles, Calif.

Sept. 17: 24th Annual Educational Meeting and Banquet, A.E.S., Hotel Statler, Boston, Mass.

Oct. 9-13: Fall Meeting, The Electrochemical Society, Shamrock Hotel, Houston, Texas.

Oct. 17-21: 42nd National Metal Exposition and Congress, A.S.M., Trade and Convention Center, Philadelphia, Pa.

to perform the installation duties. The nominating committee is composed of *Chuck Fotheringham*, chairman, *Joe Ruff* and *Roger Brown*.

John Scholterer announced that the executive committee recommends that the Branch bid for the 1966 National Convention. A motion was carried to submit a bid at the Interim Meeting.

After the business session Librarian *Dick Davis* introduced the speaker of the evening, *Christopher Marzano*, chief chemist of the Amphenol-Borg Electronics Corp., who presented a very interesting talk on "How to Plate Difficult Metals."

Robert E. Lienert
Secretary

New England Regional

The twenty-first annual educational session and banquet will be held on Saturday, April 23, 1960 at the Hotel Statler in Hartford, Conn.

Allen E. Ferguson of MacDermid Inc. is general chairman for the technical session which will begin at 3:00 p.m. in the Hartford Room. Speakers are *Frank Papcesy* of Western Electric Co., whose topic will be "Precision Barrel Finishing"; and *Jack Little*, vice-president of Incar, Inc., speaking on "Modern Trends in Nickel Plating".

While the men attend the technical session the ladies will have an afternoon of games. Chairman of the ladies program is *Ellery Gibson*.

A group of local members of the Metal Finishing Suppliers' Association will host a cocktail party from 5:00 to 7:00 p.m. in the Main Ballroom, to be followed by dinner and dancing. *Bob Boulay* is master of ceremonies for the evening entertainment, and there will be dancing until 1:00 a.m. to the music of Wm. Glenny and his orchestra.

Columbus Branch

The regular meeting was held at Battelle Memorial Institute, 8:00 p.m. on March 4, with 25 present. The business meeting opened with a discussion of details concerning the Tri-State meeting scheduled for Columbus in April, 1961. Also, a motion carried to accept the recommendations of the board of managers with regard to newly revised Tri-State By-laws.

A review of notes on the proceedings of the recent Philadelphia Interim Meeting led to a motion that the Branch look into the possibility of sponsoring a plating course. Also along an educational vein, volunteers were sought to act as judges for the coming Science Exhibit sponsored by Columbus Technical Council.

Librarian *Hugh Miller* introduced the program of the evening, an educational film and panel discussion. The film "Corrosion in Action", sponsored

by The International Nickel Co., was an excellent demonstration of the origin and nature of corrosion and of passivity. *Dr. Charles L. Faust* and *Fred Fink*, chiefs of the Electrochemical Engineering and the Corrosion Research Divisions at Battelle, respectively, answered questions on corrosion and corrosion protection. The question period was moderated by *John G. Beach*. Refreshments were served through the courtesy of Diversey and the Globe Chemical Co.

L. D. McGraw,
Secretary

SOCIETY OF DIE CASTING ENGINEERS

The First National Die Casting Exposition and Congress will be held in the Detroit Artillery Armory from November 8-11, 1960. Sponsored by the *Society of Die Casting Engineers*, the exposition will be the first show in America devoted exclusively to the rapidly expanding die casting field.

THE ELECTROCHEMICAL SOCIETY

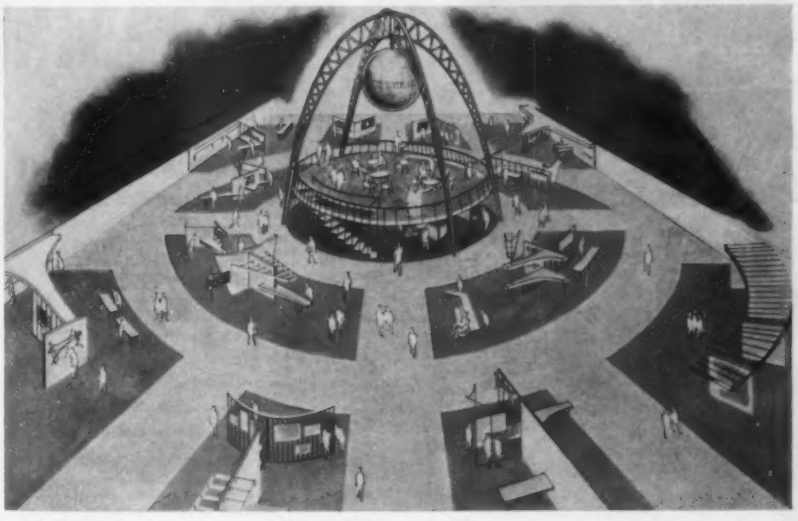
The Metropolitan section, after meeting for several years at Schwartz' restaurant on Broad St., N. Y. C., is moving to a new location at 29 Trinity Place for the April 20th meeting, since the old location is being torn down to make way for the thirty-nine story I. T. & T. building. The April meeting will be the annual business meeting of the group. *Dr. Frances Lang* of the International Nickel Co. is section chairman.

Ladies' Night, which winds up the season, will be held on May 18th.

AMERICAN STANDARDS ASSN.

The Association announces its recent move to new quarters at 10 E. 40th St., New York 16, N. Y.

AMERICAN SOCIETY FOR METALS



The forty-second national Metal Exposition and Congress will be held in Philadelphia, Pa., October 17-21, 1960. There will be exhibitors from eleven related metals areas of industry, including automotive, aircraft, appliance, ordnance, farm machinery, instruments and miscellaneous metalworking manufacturers.

The show is to be held at the unique "Steel Arena" in the Trade and Convention Center, which will provide the steel industry with a dramatic showcase of its progress and importance as the material of construction basis to the nation's economy and, at the same time, focusing attention on improved technology for all engineering materials in the show.

Further information may be obtained by writing to *Chester L. Wells*, Exposition Manager, American Society for Metals, Metals Park, Novelty, Ohio.

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4. Rinse & spray	1 Station	11. Rinse & spray	1 Station
5. Clean Anodic	5 Station	12. Warm Rinse	3 Station
6. Rinse & spray	1 Station	13. Dry	5 Station
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SITUATION OPEN — Immediate opening with large international manufacturer of consumer products. Requires supervisory experience and large volume automatic plating experience. Also good knowledge of barrel nickel plating, bright nickel, and copper and gold plating. Excellent salary and benefits. Location, eastern Massachusetts. Please send resume in confidence. Address: April 3, care Metal Finishing, 381 Broadway, Westwood, N. J.

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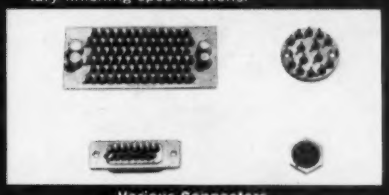
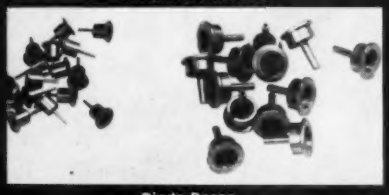
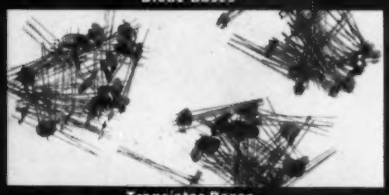


Various Connectors



Diode Bases



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These quality Autronex Gold Plated transistor products will be on display at the IRE Show Mar. 21-24, N. Y. Coliseum, Glass-Tite Industries booth #1109.

Wrap transistor-header lead wires around a 40-thousandth mandrel—subject the headers to a scorching 400°C—dip them in a highly concentrated solution of hydrofluoric, nitric and acetic acids (CP-4) and you have some idea of what Autronex Acid Gold Electroplate withstands at Glass-Tite Industries, Inc. Providence, Rhode Island. Actually, all these "tests" are functional. The transistor headers will be subjected to similar conditions by military and industrial end-users while becoming critical com-components in complex electronic equipment.

According to Mr. John Newman, Chief Chemical Engineer at Glass-Tite, the Autronex Acid Gold Electroplating Process was installed because it demonstrated dramatic superiority over other materials. On one occasion, Mr. Newman relates, Autronex Gold Plated Transistor-Headers were left in the CP-4 etch solution *overnight*—"... just to see what would happen." By morning, the glass seals had dissolved, the Autronex Gold Electroplate had not been affected.

The famous glass-to-metal, hermetically sealed transistor bases produced by Glass-Tite Industries, end up in multi-million dollar, missiles, rockets, and computers. In applications like these, only the best is good enough. That's why Glass-Tite and leading electronic component manufacturers the world-over specify Autronex Gold Electroplate.

Sel-Rex are the largest selling Precious Metal Electroplating Processes in the world. Free technical literature on request—specify application.

Trade mark for Sel-Rex patented Acid Gold Plating Process

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CI BRIGHT COPPER

Bright, high-speed, trouble-free bath. One stable, non-metallic brightener used.

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